

ANNUAL REPORT
OF THE
INDIAN CENTRAL COTTON COMMITTEE,
BOMBAY, ..
FOR THE
YEAR ENDING 31st AUGUST
1936

BOMBAY
G CLARIDGE & Co LTD.
1937

Price, Rs 2/-

A
31
5
6236

CONTENTS

	PAGE.
Personnel	1
Sub-Committees	2
Meetings	4
Staff	4
Provincial Cotton Committees	5
 Work of the Year —	
Cotton Policy	6
Compact block of long staple cotton in Sind	7
Spread of Garrow Hill Cotton in the Central Provinces	8
Bombay Cotton Control Act	8
Lancashire Indian Cotton Committee	8
Cotton Transport Act	10
Cotton Ginning and Pressing Factories Act	10
Licensing of Ginning and Pressing Factories	11
Malpractices	12
Cotton Markets	14
Universal Standards for Indian Cottons in India	16
Representation on the International Federation of Master Cotton Spinners and Manufacturers Associations	17
United Provinces Cotton Pest Control Bill	17
Means to prevent the introduction of foreign cotton pests	17
Collection and Supply of Information	18
Publicity and Propaganda	18
Publications	19
Secretary's tours	20
Financial	20
 Statistics —	
Cotton Crop Estimates	21
Improvement of Cotton Forecasts	21
Staple length of the Indian Cotton Crop	22
Press Statistics	22
Loose (unpressed) Cotton Statistics	23
Consumption	24
Exports	24
Stocks	24
Demand for various types of Indian Cotton	25
Publications	25
 Research —	
General	26
Technological Laboratory	26
Institute of Plant Industry Indore	28
Schemes in Progress	28
 Seed Distribution Schemes	47
Research Students	53

Annual Report of the Director, Technological Laboratory :—	PAGE
Introduction	54
Spinning Laboratory	54
Research Laboratory	60
Moisture Testing Section	73
Publications	74
General	85
Acknowledgments	88

Report of the Publicity and Propaganda Officer :—	
Introduction	89
Anti-Gogham Propaganda	89
Exhibitions	92
Press <i>Communiqués</i>	93
Special Article	94
Pamphlets	94
Posters	95
Leaflets	95
Handbills	95
Placards	96
Demand for Publicity Literature and greater number of enquiries	96
Publicity Officer's tours	96
Appreciation of Committee's work	96

APPENDICES

I	Members of the Committee	98
II	Constitution of Sub Committees	100
III	List of Resolutions	103
IV	Annual Report of the Director, Institute of Plant Industry, Indore, and programme of work for 1936-37	105
V	Bombay Cotton Control Act	163
VI	Cotton Ginning and Pressing Factories (Bombay Amendment) Act	166
VII	Cotton Ginning and Pressing Factories (Central Provinces Amendment) Act	171
VIII	United Provinces Cotton Pest Control Bill	176
IX	Progress in the introduction of improved varieties of cotton	183
X.	Balance Sheet, Statement of Accounts and Statement showing expenditure under Research and Seed Extension Schemes up to the 31st March 1936	190
XI	Statement of Raw Cotton Consumption	203
XII	Stocks of Indian Raw Cotton held in India on the 31st August 1936	205
XIII	Exports by Sea of Indian Raw Cotton classified by varieties	209
XIV	Receipts at mills in India of Raw Cotton classified by varieties	210
XV	List of Scientific and Technical Officers paid from the Indian Central Cotton Committee's funds as on August 31st, 1936	212
XVI	List of Research Students	228

Annual Report of the Indian Central Cotton Committee for the year ending 31st August 1936

CHAPTER I

As a result of one of the recommendations of the Indian Cotton Committee of 1917-18 the Indian Central Cotton Committee was constituted by the Government of India in the Department of Revenue and Agriculture by their Resolution No 401-22 dated the 31st March 1921. Originally its functions were purely of an advisory character but with its incorporation under the Indian Cotton Cess Act in 1923 the Committee became an administrative body having at its disposal funds for the improvement and development of the growing marketing and manufacture of cotton in India. The Committee thus exercises its functions in a dual capacity. Firstly it advises the Government of India local Governments and Indian States on subjects connected with the growing and marketing of cotton and brings to their notice matters which in its opinion require attention. Secondly it provides funds for research into cotton problems of an All India importance or for large areas where cotton is an important crop and for the extension and marketing of improved varieties of cotton. The research portion of the Committee's work has passed the experimental stage as will be seen in Chapters IV and V of this report.

The Committee also serves as a common meeting ground for all branches of the cotton industry since all the main interests associated with cotton viz the grower the spinner the exporter the millowner and the agricultural expert are represented on it. Whilst the Committee's constitution thus ensures a broad outlook on the many problems affecting the cotton industry its primary concern is the interest and welfare of the cotton grower.

PERSONNEL

2. In Appendix I will be found a list of members of the Committee as it stood on the 31st August 1936. Under the Indian Cotton Cess Rules members who are not *ex-officio* members hold office for three years and one-third of their number retire each year in rotation.

Dr F J F Shaw OBE IAS Offg Agricultural Expert to the Imperial Council of Agricultural Research and an *ex-officio* member of the Committee, died during the year and the Committee at its meeting in August 1936 recorded its appreciation of the services rendered by him not only to the Committee but also to the country as a whole.

SUB-COMMITTEES

3 Most of the detailed work of the Committee is carried on by means of Sub-Committees and thereby much of its time is saved at its half-yearly meetings. The Committee is greatly indebted to the members of the various Sub-Committees for their invaluable assistance and hearty co-operation in furthering the work of the Committee, more particularly are its thanks due to the members of the Standing Finance and Local Sub-Committees who are required to attend to the business of the Committee at more frequent intervals.

The functions of the various Sub-Committees are detailed below and their composition as on the 31st August 1936 is given in *Appendix II*.

(a) *The Standing Finance Sub-Committee* is a statutory Sub-Committee and is the principal executive body of the Committee. By a resolution of the Committee one of the members of this Sub-Committee must be a representative of cotton growers. Eight meetings of this Sub-Committee were held during the year.

(b) *The Local Sub-Committee* deals with all matters of a general nature, not involving finance, which cannot be postponed for consideration to the half-yearly meetings of the full Committee. Eight meetings of this Sub-Committee were held during the year.

(c) *The Cotton Ginning and Pressing Factories Sub-Committee* is appointed by statute to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. This Sub-Committee did not meet during the year. The more routine work of this Sub-Committee was disposed of by the Local Sub-Committee.

(d) *The Agricultural Research Sub-Committee* ordinarily assembles half-yearly during the meetings of the full Committee, it reports on the progress made on schemes financed by the Committee, examines proposals for new schemes or extensions of those already in operation and considers the reports of research students.

(e) *The Technological Research Sub-Committee*, like the Agricultural Research Sub-Committee, generally meets during the half-yearly meetings of the full Committee and deals with all matters connected with the Technological Laboratory and technological research.

(f) *The Research Students Selection Sub-Committee*, as its name implies, selects students to whom scholarships or training grants are awarded for the purpose of undergoing training in research in the several sciences relating to cotton. One meeting of this Sub-Committee took place during the year.

(g) *The Sub-Committee on Malpractices* was originally formed with the object of dealing with all references concerning abuses and malpractices in regard to Indian cotton. As it was felt that the work of this Sub-Committee could conveniently be dealt with by the Cotton Ginning and Pressing Factories Sub-Committee the full Committee resolved at its meeting held in January 1936 to discontinue it.

(h) *The Forecast Improvement Sub-Committee* usually meets half yearly its principal business being the improvement of the cotton forecasts of India.

(i) *The Special Sub-Committee on Wider Markets* was appointed in 1933 with the object of examining the question of finding wider markets for Indian cotton. It met twice during the year under report.

(j) *The Standards Sub-Committee* was constituted in April 1933 and is concerned with the preparation for use in India of universal standards of certain growths of cotton dealt with in common both by the East India Cotton Association and the Karachi Cotton Association and of certain other varieties with which only the former Association is concerned. Six meetings of this Sub-Committee were held during the year.

In addition to the abovementioned Standing Sub-Committees special Sub-Committees are appointed from time to time to deal with specific matters which do not fall within the purview of any of the other Sub-Committees.

4. Whilst the Committee is representative of practically all sections of the cotton trade in India it also enjoys the privilege of deputing representatives to serve on other bodies. Thus Sardar Rao Bahadur Bhimlhal Ranchodji Nask represents it on the Imperial Council of Agricultural Research and he along with Mr N M Deshmukh and Sardar Sampuran Singh represented the Committee on the Board of Directors of the East India Cotton Association up to 31st March 1936 when the last two were replaced by Mr M P Kolhe and Mian Nurullah. On the Joint Sub-Committee of the Imperial Council of Agricultural Research and of the Indian Central Cotton Committee in connection with the investigation into the cost of growing cotton sugarcane and their rotation crops the Committee is represented by Sir Purshotamdas Thakurdas Sardar Rao Bahadur Bhimlhal Ranchodji Nask Mr J Vonesch, Mr Chunilal B Mohita Mr Chimanlal B Parikh (representing the East India Cotton Association) and the Secretary. The representatives of the Committee on the Board of Governors of the Institute of Plant Industry Indore are the President the Vice-President (Sir Purshotamdas Thakurdas) Mr Chunilal B Mohita Mr S D Saklatvala Mr J Vonesch Sardar Rao Bahadur Bhimlhal Ranchodji Nask, Mr Kasturbhai Lalbhai Mian Nurullah and the Secretary. The Committee is an Associate Member of the International Federation of Master Cotton Spinners and Manufacturers Associations.

MEETINGS.

5 The Indian Central Cotton Committee held two meetings during the year under review, both at Bombay. The first meeting took place on the 13th and 14th January 1936, and the following were among those who attended it by invitation —

Sir Richard H Jackson, Chairman, Lancashire Indian Cotton Committee, the Hon'ble Dewan Bahadur S T Kambli, J P., Minister for Agriculture, Government of Bombay, the Hon'ble Khan Bahadur D B Cooper, J P., Member for Revenue and Finance, Government of Bombay, Mr C G Freke, I C S, Secretary to the Government of Bombay, Finance Department, Mr N C Mehta, I C S, Secretary, Imperial Council of Agricultural Research, Mr N Brodie, Director, Industrial Intelligence and Research Bureau, Indian Stores Department, Mr W D M Clarke, His Majesty's Trade Commissioner at Bombay and Mr H C. Short, Cotton Commissioner, Lancashire Indian Cotton Committee

The second meeting, which was held on the 17th and 18th August 1936, was honoured by the presence of His Excellency the Hon'ble Sir Robert Duncan Bell, K C S I, C I E Acting Governor of Bombay. Amongst the other visitors present were Mr C H Bristow, I C S, Private Secretary to His Excellency the Governor of Bombay, Mr P K Norris, Agricultural Commissioner, U S A Department of Agriculture and Mr N Brodie, Director, Industrial Intelligence and Research Bureau, Indian Stores Department

A list of the more important resolutions passed at these two meetings will be found in *Appendix III*

STAFF.

6 Mr P H Rama Reddi continued to hold charge of the office of Secretary throughout the year

The temporary gazetted post of Personal Assistant to the Secretary, held by Mr C J Bocarro, was abolished during the year and a permanent gazetted post of Assistant Secretary was created to which Mr Bocarro was appointed

Dr Nazir Ahmad held the post of Director of the Technological Laboratory during the year and Mr R D Mihra that of Publicity Officer

I am happy to be able to record once again my sincere appreciation of the loyal co-operation which I continued to receive during the year from every member of the office staff.

PROVINCIAL COTTON COMMITTEES

7 The value of Provincial Cotton Committees in dealing with problems of provincial importance has been stressed in previous reports and once more the Committee records its view that where such Committees are actively functioning the work done by them has materially assisted the Committee in arriving at decisions on subjects referred to it. Local problems can be visualised in their true perspective best by Provincial Committees and therefore the discussions and the decisions of such Committees help to bridge over difficulties which the absence of the knowledge of local conditions unavoidably creates. During the year under review the Sied and the Punjab Cotton Committees each met once and much useful work was transacted by them. The Madras Cotton Committee dealt with the scheme for the improvement of *Isungari* cotton by correspondence without actually meeting. It is hoped that the coming years will witness a revival of the activities of Provincial Cotton Committees.

CHAPTER II.

WORK OF THE YEAR

COTTON POLICY.

8 The last Annual Report referred to the conclusions arrived at by the Committee on the investigations into the possibilities of growing cotton of long and medium staple in the present short staple cotton areas of India. Whilst these investigations were undertaken primarily as a result of the threatened Japanese boycott of Indian cotton in 1933 and the consequent growing apprehension of the serious risk India ran by depending too much on the limited market for her short stapled cotton, they have yielded information which will be of considerable value in framing the future cotton policy of the country in view of the world's present tendency towards the spinning of finer counts for which short staple cotton is unsuitable. The survey further brought to light the fact that apart from these areas which were suitable for the production of long or medium staple strains and where already the cultivation of such types was on hand, the adoption of dry-farming methods of cultivation in certain tracts would overcome the difficulties imposed on the growing of long and medium staple cotton by reason of the precarious rainfall of the tracts in question. Investigation on these lines is accordingly being undertaken in the Westerns tract of Bijapur district in the Bombay Presidency and in the Raichur and Gulbarga districts of the Hyderabad State with the aid of grants to the Imperial Council of Agricultural Research, who have already in operation dry-farming schemes in those tracts. A further step forward has been taken in connection with the improvement of *Dholleras* cotton, as during the year the Committee sanctioned a scheme having for its object the tackling of the cotton problems of the *Dholleras* tract—an extensive area to which little attention had been paid in the past. The collection of *Iran* cottons for the purpose of evolving early *herbaceum* strains suitable to some parts of the *Dholleras* tract was also set in motion during the year. The eradication of the Pink Boll-worm in the United Provinces which is expected to lead to the improvement of the quality of cotton in the United Provinces has definitely proceeded forward with the introduction of the Cotton Pest Control Bill in the United Provinces Council.

The activities of the Committee are steadily forging their way into the agricultural economy of the country and those acquainted with its history will not have failed to notice how the work of the Committee has extended and expanded in the course of years and how certain schemes of the Committee have, as through a process of natural evolution, found their counterpart in schemes of another type. For instance, the old breeding and survey and mycological schemes have developed into seed distribution and extension schemes and from entomological schemes have sprung up schemes for clean up propaganda and schemes for popularising the use of plant pullers for up rooting cotton stubbles.

It has been urged in some quarters that the Committee should extend its activities by including in its programme investigations on soil fertility and on improvements in the method of compost manufacture. The importance of these problems is fully realised by the Committee but it has always held the view that work on these lines is the function of Provincial Agricultural Departments and that it is not a special problem of cotton cultivation. The study and demonstration of methods for the maintenance of soil fertility is a fundamental part of the work of Agricultural Department and they are already devoting considerable attention to it. The Committee has deliberately concentrated on problems connected with cotton in preference to that affecting all crops in all parts of the country. The Committee aims at supplementing and not supplanting the work of the Agricultural Department and so far there has been no occasion for it to deviate from this accepted principle.

COMPACT BLOCK OF LONG STAPLE COTTON IN SIND

9 It was stated in last year's report that the Government of Bombay had by resolution signified their approval of the Committee's recommendation regarding the establishment of a compact block of long staple cotton of 300 000 acres in Sind and had expressed their concurrence with the conclusion arrived at by the Chief Agricultural Officer in Sind that the area south of the Jodhpur Railway was the most suitable for such purpose. During the year under review the Cotton Ginning and Pressing Factories (Bombay Amendment) Act 1930 which provides for the licensing of gins and presses was passed into law and was made applicable in the first instance to the province of Sind with effect from such date as the Local Government may by notification appoint. Owing to certain difficulties which subsequently arose the issue of the notification has however been delayed. The Act has for its object the prevention of malpractices arising from the watering, mixing or admixture of cotton and the desirability of the early application of the Act to Sind, where the malpractices referred to are non-existent or only in their incipient stage led the Committee at its meeting in August 1930 to pass a resolution urging on the Government of Sind the necessity of taking very early steps to make the Cotton Ginning and Pressing Factories (Bombay Amendment) Act effective in that province by framing rules as early as possible before malpractices became established in the newly developed cotton tracts. With regard to the reservation of compact block for the growing of superior varieties of cotton the Bombay Government have declared that in accordance with the policy of the Agricultural Department in Sind the seed of the improved varieties 280F and 280F (1) only will be distributed in this area. In the opinion of the Local Government the application of the Cotton Transport Act to the proposed block in order to prevent the importation of *kapas* from outside the area for purposes of mixing presents practical difficulties. They consider that the absence of natural boundaries around the cotton growing areas and the lack of regular routes of communications in Sind would make the enforcement of the Act both costly and difficult. Should however experience

indicate at a later stage of development of the area that it is desirable to prohibit the import from the Punjab by rail of inferior seeds into Sind for sowing purposes, necessary action will be taken. It is felt, however, that such action would be possible only when an adequate supply of the seed of the varieties 289F and 289F(1) are available for the tract—a condition which, it is estimated, would take two years to fulfil.

SPREAD OF GARROW-HILL COTTON IN THE CENTRAL PROVINCES

10 The recommendation of the Central Provinces Provincial Cotton Committee, which was endorsed by the Committee last year for the adoption of legislative measures for the eradication, from the Central Provinces and Berar, of *Garrow-Hill* cotton, a very inferior short staple but prolific variety, which has lowered the reputation of even the superior types of cotton in the tract, was accepted by the Central Provinces Government. A Bill* for the prohibition of the cultivation of *Garrow-Hill* cotton in the Central Provinces was introduced in the Central Provinces Legislative Council and has been referred to a Select Committee.

BOMBAY COTTON CONTROL ACT

11 As foreshadowed in last year's report, the Bombay Government introduced in the Legislative Council in September 1935, the Bombay Cotton Control Bill, having for its object the prohibition of the cultivation, mixing or possession of *Goghari*, an inferior type of cotton which was spreading to an alarming extent in the Surat tract and threatening the reputation of 1027 *A L F* to the detriment of the cotton growers of Surat. With commendable expedition the Bill passed into law in November 1935. The Committee is confident that this piece of legislation will go a long way towards improving the quality of cotton of the Surat tract and that the benefits to the grower expected from the Act will soon be realised. A copy of the Act will be found in *Appendix V*.

As *Goghari* was spreading also in the Baroda State whose territory is interlaced with the Bombay Gujarat, the Durbar, by notification, applied the provisions of the Bombay Cotton Control Act, with slight modifications, to the State.

LANCASHIRE INDIAN COTTON COMMITTEE

12 The work of the Lancashire Indian Cotton Committee as recorded in its 2nd Annual Report evoked the commendation of the Indian Central Cotton Committee at its meeting in August 1936, when the report was considered. Whilst expressing its satisfaction that through the sustained efforts of the Lancashire Committee the takings of Indian cotton by Lancashire exceeded 500,000 bales, the Committee could not avoid the feeling that a considerable field still existed for the more extended use of Indian cotton in the United Kingdom. On the basis of a production of yarns up to 20's counts only, it has been roughly computed that Lancashire's

* This Bill has since become law.

requirements of raw cotton amount to 1,363,000 bales and for much of this Indian cotton is suitable. Even allowing for the fact that Lancashire mills employ a certain quantity of waste and long staple cotton in the production of yarns up to 20 a the gap between potential consumption and present achievement is still far too wide and until this gap is considerably reduced the position cannot be viewed with equanimity from the Indian standpoint. The Committee is not unmindful of the existence of factors which militate against the adoption in manufacture of a class of cotton not previously employed and of possible prejudices to be overcome anterior to such employment but it is confident that with the judicious use of the weapon of propaganda which has already proved to be effective reinforced with the experience of the past the aspect of the problem will be changed in the not distant future. The large increase in the takings of Indian cotton in the last three years is a striking testimony to the efficiency of the organisation and propaganda of the Lancashire Indian Cotton Committee. It has been suggested to the Lancashire Indian Cotton Committee that one direction in which the use of Indian cotton in the United Kingdom could be furthered was by approaching the subsidiary industries like the woollen belting gun cotton and explosives motor car, etc. which consume a certain quantity of cotton in the manufacture of various articles and by impressing upon them the desirability of using Indian cotton in preference to foreign growths. The Lancashire Indian Cotton Committee is fully assured of the goodwill and co-operation of the Indian Central Cotton Committee in the mutual aim of the two bodies for the more extended use of Indian cotton in the United Kingdom.

The following figures of consumption of Indian cotton by and the imports of Indian cotton into the United Kingdom are very illuminating in regard to the achievements of the Lancashire Indian Cotton Committee and the progress made by Indian cotton in Great Britain —

Year (August 1 to July 31)	Lancashire Indian Cotton Committee.	Liverpool Cot- ton Association.	Depart. of Com- Intelligence & Statistics, Calcutta.	Total exports to all countries.
	Millions of lbs (Consumption)	Thousands of bales (Running) (Imports into U K.)	Exports to U K. (Thousands of bales of 400 lbs)	
1928-29	72	228	233	3 033
1929-30	73	201	286	3 868
1930-31	98	281	274	3 729
1931-32	72	137	128	1,592
1932-33	40	230	257	2,868
1933-34	92	362	367	3,270
1934-35	133	394	374	3,115
1935-36	Figures not available.	547	533	3 826

From 1931-32 exports from Kathiwar Ports are included.

THE COTTON TRANSPORT ACT.

13 At the request of the Indian Central Cotton Committee the Government of India passed in 1923 the Cotton Transport Act, which enables local Governments to prohibit the import for purposes of mixing and substitution of inferior cotton into areas growing superior varieties within their jurisdiction

Madras —There was no change in the protected areas in the Madras Presidency

Bombay —Only one of the seven protected areas notified in the Bombay Presidency changed during the year under report. It was stated in the last year's report that the Committee approved of a proposal of the Director of Agriculture, Bombay Presidency, to fix the Mahi river as the northern boundary of the Nerbudda-Mahi protected area. The Local Government have since accepted this proposal and have notified the change accordingly.

Central Provinces —During the year the Narsinghpur Sub-Division was included in the protected area with the object of preventing the import of *Bengals* cotton into the province for the purpose of mixing.

Indian States —There was no change in the protected areas in Hyderabad, Indore, Sangli, Rajpipla and Chotta Udepur which are the only Indian States that have such legislation in force.

THE COTTON GINNING AND PRESSING FACTORIES ACT.

14 During the year under report nearly a score of cases of infringement of the Act were brought to the notice of the authorities concerned. In some cases either the wrong year or indecipherable or incorrect marks were put on bales, while in one or two cases press marks were absent. In almost all cases the factory owners were warned, in only one case in the United Provinces a fine of Rs 25 was imposed on a factory owner. In cases where breaches were due to misunderstanding of the procedure, instructions as to the proper method of marking bales were issued to factory owners and they were directed to be more careful in future. In one case regarding the issue of bales with incorrect marks a District Magistrate held the view that an arbitration award of the East India Cotton Association was inadmissible in evidence in Law unless it was proved by the evidence of the arbitrator and the survey clerk and considered that the production of this evidence would involve Government in much greater expense than the amount to be realised from fines. The East India Cotton Association, to whom the matter was referred, held that if this attitude were adopted the Act would remain a dead letter and they suggested that the difficulty and expense of producing evidence could be got over by issuing a commission to Bombay to take the evidence of the seller, one of the arbitrators and the survey clerk.

Mention was made in last year's report of the warning given by a Collector to a factory owner for the use of unauthorised weights in the factory and of the fact that the attention of the Local Government was drawn to the leniency of the punishment. The Local Government concerned issued a circular to all District Magistrates instructing them to institute prompt proceedings against factory owners caught using unauthorised scales or weights as such practices involved loss to the illiterate cultivator.

Most cotton producing Indian States have fallen into line with British India in legislating for the purpose of the marking of bales and the submission of weekly returns of cotton pressed. During the year the Maliya and Khairpur States introduced similar legislation thus bringing the total to 67. Out of these weekly press returns were received from sixty Gwalior being amongst those from whom such returns were not received.

LICENSING OF GINNING AND PRESSING FACTORIES

15 It is gratifying to record that one of the first pieces of legislation advocated by the Committee almost since its inception has at last found a place in the statute book of the Bombay and Central Provinces Governments. This step was taken as the result of the decision of the Government of India not to undertake legislation themselves for the licensing of ginning and pressing factories but to leave it to local Governments to do so if they desired. Acts amending the Cotton Ginning and Pressing Factories Act were passed by the two Local Governments mentioned making it obligatory on all cotton ginning and pressing factories situated in areas to which the Act may be applied to take out licenses and prohibiting watering, mixing or admixtures of cotton. It is the belief of the Committee that these measures will go a long way in suppressing the malpractices which are detrimental to the interests of the cotton grower as they mar the fair name of Indian cotton both in India and abroad. Although the Bombay Act has in the first instance been made applicable to Sind—now a separate province—it will not as originally hoped be in operation during the revenue year 1936-37 as the Sind Government have not been able to pass the necessary rules under the Act before the commencement of the cotton season. The Bombay Government have under contemplation the application of the Act to other parts of the Presidency. Owing to the enactment of similar legislation by the Central Provinces Government the Indian Central Cotton Committee at its meeting in August 1935 passed a resolution urging on the Bombay Government to apply the Act to the Khandesh tract of the Bombay Presidency. The Central Provinces Act extends to the whole of the province and will be in operation as soon as the required rules which are under the consideration of the Local Government have been framed. Copies of the Bombay and Central Provinces Amendment Acts will be found in *Appendices I I and I III*. The Punjab Government have also under consideration the introduction of a similar measure the chief problem there being the mixing of cotton. Among Indian States Hyderabad has been a pioneer in the field of legislation of this type the licensing of cotton ginning and pressing factories being in operation there from 1931.

MALPRACTICES.

16 The East India Cotton Association reported five cases of bales having been rejected or awarded "off" allowance on account of the cotton being heavily watered. These bales were from Navsari and Shendurni (East Khandesh), in the Bombay Presidency, Viridhunagar in the Madras Presidency, and Mandi Dabwali in the Punjab. Certified copies of entries in the press registers pertaining to the bales in question were called for under Section 3(3) of the Cotton Ginning and Pressing Factories Act and the information received was passed on to the East India Cotton Association.

An exporting firm in Bombay reported that two lots of 48 and 41 bales each of cotton purchased by them were found to be heavily watered. As the press marks showed that the bales came from Arvi, a certified copy of the entry in the press register relating to the bales in question was called for and the information was supplied to the firm concerned.

Complaints were received from Japan to the effect that full pressed bales were being opened in Bombay and after being fraudulently mixed with inferior cotton were repressed and exported to Japan. The East India Cotton Association, which had also received similar complaints, had replied pointing out that as Bombay grew no cotton, bales pressed in Bombay would indicate by their very name that the cotton was mixed and that as exporters purchasing such cotton had ample opportunities to inspect the cotton such bales could not be described as "false packed". In view of the reply sent by the East India Cotton Association the Committee considered that no further action was necessary and the attention of the complainants was merely drawn to the reply of the Association.

Complaints were also received from the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester, about the presence of foreign matter in Indian cotton. The Committee felt, however, that a general condemnation of the ginning of Indian cotton was not helpful towards a solution of the question and also that the complaints themselves were greatly exaggerated. The Federation were informed that the Committee fully realised the importance of exporting cotton in such a condition as not to give room for any complaint though actually the number of complaints reported was very small in comparison with the size of the Indian cotton crop. In its opinion, Indian cotton was far more even running and free from foreign matter than any other growths and improvement was already taking place as a result of better supervision. Steps could only be taken to improve the present position if foreign spinners reported the press marks and serial numbers of bales containing badly ginned cotton. Intimation was subsequently received that the reply of the Committee was fully discussed by the International Cotton Committee at its meeting in April 1936, and it was admitted that the Indian Central Cotton Committee was doing its best to eliminate the cause of spinners' complaints in East Indian cotton.

A complaint from one of the members of the Committee regarding the unsatisfactory ginning and pressing of *Punjab-America* cotton was reported to the Director of Agriculture Punjab who issued a circular to all owners of ginning and pressing factories asking them to take steps to avoid the recurrence of such complaints and to take necessary precautions to raise the standard of the ginning and pressing of cotton.

A reference from the Hyderabad State regarding the presence of excessive seed in pressed bales of cotton was forwarded for an expression of opinion to the East India Cotton Association who suggested in reply the installation in ginning factories of special sieves about four feet square made either of haling hoops or expanded metal whereby the cotton would be caught up and the seed which accidentally got mixed with the cotton would drop through the sieves. This suggestion was passed on to H. E. H. the Nizam's Government.

As a result of reports received during the year that mill fly droppings cotton waste and even old crop cotton were being mixed with good cotton in Khandesh the matter was brought to the notice of the Bombay Government with the object of their taking steps under the Cotton Ginning and Pressing Factories (Bombay Amendment) Act for the effective prevention of this malpractice. In their reply the Bombay Government expressed their intention of awaiting the results of the propaganda work which the Agricultural Department was carrying on against the practice in question before taking action in the matter.

In connection with the mixing of cotton waste with good cotton it was noticed that cotton waste was being brought to the Dhulia cotton market in increasing quantities and as most of it was used for mixing with good cotton, a reference on the subject was made to the Chairman of the Dhulia Cotton Market Committee. He reported that the entry of cotton waste into the market could not legally be prevented since dealings in cotton waste were recognised under the Bombay Cotton Markets Rules. He however considered that the only remedy for preventing the mixing of fly mill-droppings and cotton waste with good cotton was the application of the Cotton Ginning and Pressing Factories (Bombay Amendment) Act to the whole of the Khandesh tract and the amendment of the definition of "cotton" so as to exclude from it cotton waste and mill droppings which should be brought under the category of foreign substance.

The Committee at its meeting in August 1936 passed a resolution requesting the Government of Bombay to extend the Cotton Ginning and Pressing Factories (Bombay Amendment) Act to East and West Khandesh and other tracts of the Bombay Presidency, particularly in view of the fact that the Central Provinces Government had already passed similar legislation. The resolution also drew the attention of the Government of Bombay to the fact that the Bombay Act as at present worded did not

prevent the mixing of cotton waste with cotton and requested them to take in hand the necessary amendment for this purpose

The presence of seed and impurities in full pressed bales from various places in the Punjab and the Patiala State continued to be the subject of complaints. The Director of Agriculture, Punjab, was requested to bring the complaints to the notice of factory-owners concerned in the Province and to impress on them that such malpractices lowered the reputation of the cotton of the tract and adversely affected the interests of the trade and the cultivators. Action as suggested was accordingly taken. As regards the complaints from the Patiala State, the attention of the State authorities was drawn to the careless manner in which ginning was done and to the existence of admixtures of seed in Patiala cotton. Intimation was subsequently received to the effect that steps were being taken to put a stop to the malpractice complained of and that a warning had been issued to the factory-owners.

At the suggestion of a cotton exporting firm in Karachi, the Karachi Cotton Association was addressed regarding the desirability of circularising during the coming season those presses which in the past season had pressed cotton containing impurities informing them that the press marks of presses found indulging in malpractices would be posted at the rooms of the Karachi Cotton Association and also that copies of such postings would be sent to the East India Cotton Association, Bombay, for taking similar action. The Karachi Cotton Association decided to address the factories concerned first in a friendly way and to await the result of the propaganda carried on before taking action on the lines suggested.

In the absence of legislation for the suppression of malpractices, a suggestion was made to the East India Cotton Association, that they should tackle the problem by imposing penalties and issuing, if necessary, instructions to its surveyors and arbitrators to be more strict in their awards. In their reply the Association stated that the question of taking effective measures against watering would be considered by the Board after the results of tests on the moisture content of cotton become available. As regards false packing, the Association had under consideration the question whether cotton containing excessive seed and/or crushed seed should be rejected by the award of sufficient "off" allowances irrespective of other characteristics of the cotton.

COTTON MARKETS.

17 In the Bombay Presidency, a cotton market was established at Dhulia in 1930, another at Amalner in 1934 and a third at Bailhongal in 1935. During the year under report no appreciable progress was made in the establishment of regulated cotton markets though Bombay Government expressed themselves as being in favour of establishing regulated cotton markets at Broach and Bijapur and at Bavla in the Ahmedabad District.

In the Central Provinces two regulated cotton markets have been in existence under their Act which was passed in 1932—one at Warora and another at Chanda. The reasons given for the non-establishment of a larger number of regulated markets were (1) the apathy or active opposition of local bodies in whose hands lay the initiative of applying for their establishment for fear of losing power, (2) the reduction of the income from cotton markets owing to the failure of the cotton crop for four consecutive years and (3) the small volume of cotton marketed in some places which did not justify the formation of a separate market for cotton. The Central Provinces Legislative Council passed during the year under report a law empowering the Local Government to establish regulated cotton markets even without the consent of the local bodies concerned. It is hoped that this measure will lead to the more rapid establishment of regulated cotton markets. The Municipalities of Wardha and Hinganghat have already applied for the issue of the necessary notification making the Act applicable to the markets at those stations. The Local Government have under contemplation the application of the Central Provinces Act to Borar also and the repeal of the separate Act in force there.

In the Madras Presidency there is only one regulated market—at Tiruppur in the Coimbatore District—established under the provisions of the Madras Commercial Crops Markets Act 1933. During the year two amending Acts to the Madras Commercial Crops Markets Act were passed, the first of which empowers the Government to nominate all the members of Market Committees when a Market Committee is to be established for the first time; this ensures that no time is lost in connection with the elections before a Market Committee is brought into existence. The original Act required that out of the twelve members constituting the Market Committee two should be nominated by Government and the rest elected. This amendment further confers on the Local Government the power to alter the limits of the notified area. The second amendment makes it obligatory on all ginning and pressing factory owners to take out licences to enable them to carry on their business for the sale and purchase of cotton. This Act further provides for dealing with the continued absence of members of Market Committees.

The Punjab Government are for the present not in favour of the establishment of regulated cotton markets.

In Sargol State the original Huxur Order regulating the sale and purchase of commercial crops in the State continued to be in force.

In the Baroda State the framing of rules under the Baroda Agricultural Produce Markets Act referred to in previous reports is still under contemplation.

In Hyderabad State there are several cotton markets to which the Hyderabad Agricultural Markets Act has been applied.

UNIVERSAL STANDARDS FOR INDIAN COTTONS IN INDIA

18 In accordance with the Committee's decision the Standards Sub-Committee passed during the year under report the universal standards in India for the following varieties of cotton —

<i>Bengals</i>	<i>Sind-American</i>	<i>Mathias.</i>
<i>Sind.</i>	<i>Kumplas</i>	<i>Broach</i>
<i>Punjab-American</i>	<i>Oomias</i>	<i>Dholleras.</i>

The reference standards of the Committee were stored at Bangalore in hermetically sealed zinc cases and on being compared at the time of the preparation of the current season's standards with the duplicate set stored at Sewri in the ordinary way, they were found to be about half a grade better in colour. The Standards Sub-Committee accordingly decided that in future the Sewri sets also should be preserved in hermetically sealed zinc cases with a view to finding out to what extent the variation in colour was attributable to difference in climate between the two places of storage. It might perhaps not be without interest to record here the reasons which led the Committee to move in the direction of establishing universal standards for Indian cotton and the extent to which its objective has been accomplished. Prior to 1933 there were two separate bodies in India which prepared standards for Indian cotton, viz, the East India Cotton Association and the Karachi Cotton Association, the latter Association prepared standards for *Bengals*, *Sind*, *Punjab-American* and *Sind-American* cottons only whilst the former had, in addition to standards for the first three varieties of the cottons mentioned, standards for other varieties of Indian cotton also. It was observed that the standards of the cottons dealt with by the two Associations differed from each other and as this resulted in certain amount of competition between the two markets which was likely to be detrimental to the interests of the cotton trade as a whole, it was considered desirable to adopt standards which would be of universal application throughout the country. It was also felt that the Indian Central Cotton Committee was the body best fitted to take the initiative in this matter and as a result of the Committee's intervention standards common both to the Bombay and Karachi cotton markets were prepared for the first time in 1934. Whilst it is too early to expect any appreciable trading in these Universal standards, it is noteworthy that the Karachi Cotton Association have decided to accept the Universal Standards of the Committee as the basis for the Karachi standards, and that the Standards Committee of the East India Cotton Association have recommended to the Board of Directors of the Association that the Universal Standards should be adopted as the basis for the preparation of the official standards of the Association. Thus in respect of the varieties of cotton dealt with by both the Associations, the standards for them will be common in all but name.

REPRESENTATION ON THE INTERNATIONAL FEDERATION OF MASTER COTTON SPINNERS AND MANUFACTURERS ASSOCIATIONS

19 Mention was made in last year's report that in order to deal more effectively with complaints arising abroad regarding faults often of a minor nature, in Indian cotton which frequently received wide publicity through the publication of the proceedings of the bodies at which they were discussed, the Committee considered it desirable to obtain if possible representation on the International Federation of Master Cotton Spinners and Manufacturers Associations Manchester. The Committee has since been admitted as an Associate Member of the Associations and this will ensure the proper presentation of the position in India both by the Committee or its duly appointed representatives whenever cases relating to Indian cotton come up for discussion at meetings of the Federation.

THE UNITED PROVINCES COTTON PEST CONTROL BILL.

20 The cotton crop of the United Provinces is subject to attack by the Pink Bollworm and it is calculated that upwards of 25 per cent. of the crop of this province in normal years and nearly 50 per cent. in some years is destroyed by this insect pest. The normal loss to the cultivator is estimated at Rs 10 to Rs 15 per acre. As a result of continued research between 1923 and 1931 financed by the Committee it has been ascertained that the treatment of all cotton seed by heating to an appropriate temperature kills the hibernating larvae and diminishes the attacks of this pest with consequent increase in yield and income. To reduce its depredations the United Provinces Government have accordingly introduced in the local legislature the United Provinces Cotton Pest Control Bill * which provides for all cotton seed in the notified area to be subjected to heat treatment before being sown. With the passing of this piece of legislation the cultivators within the sphere of its operation will reap the higher profits which the investigation has shown to be possible as the result of the heat treatment of seed which destroys the Pink Boll worm larvae. This legislation may be regarded not only as the culmination of a long period of successful research work but also as the first essential for one of the most important items of future progress viz., the growing of long staple cotton in the United Provinces.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS

21 *The Mexican Boll-weevil (Anthonomus grandis)*—The restrictions placed by the Government of India in 1925 on the import of American cotton into India with a view to prevent the introduction of the Mexican Boll weevil continued in force without change, during the year under review. Under these regulations American cotton can be imported into

* The Bill has since been passed into Law (Appendix VIII)

India only through the port of Bombay and after fumigation with hydrocyanic acid gas on payment of the prescribed fees Imports of American cotton declined to 21,121 bales during the year from 63,171 bales in the preceding year During the year the Government of India at the request of the Committee made permanent the reduced fees of Rs 2-7 per square bale and of Re 1-8 per round bale of American cotton

The Red (Sudan) Boll-worm (Diparopsis castanea) and other pests — The entire prohibition of the import of foreign *kapas* (unginned cotton) under Government of India Notification No 897-Agr, dated the 24th July 1925, and the restrictions placed on the import of foreign cotton seed under Notification No 1213-Agr, dated the 27th May 1930, of the Government of India in the Department of Education, Health and Lands remained in force throughout the year Under the 1930 Notification 10 parcels of cotton seed were received, examined, and where necessary, fumigated, during the year

COLLECTION AND SUPPLY OF INFORMATION

22 As usual, notes* on the progress in the Provinces and Indian States in the introduction of improved varieties of cotton and on the work of the Committee were supplied to the East India Cotton Association and the Karachi Cotton Association for publication The weekly statements of purchases and arrivals of American cotton were published as usual for general information The names of ginning and pressing factories in Indian States with the requisite details regarding press marks, name of owner or occupier, etc, were obtained and communicated to the Director General of Commercial Intelligence and Statistics, Calcutta, for publication in the *Indian Trade Journal* and for incorporation in the list of Cotton Ginning and Pressing Factories published by that Department

PUBLICITY AND PROPAGANDA.

23 The Annual Report of the Publicity Officer, which forms Chapter VII of this Report, gives a full account of the activities of the Publicity and Propaganda Department of the Committee

The most important event of the year was the drive initiated by the Bombay Department of Agriculture, with the Committee's co-operation to eliminate the inferior type of cotton known as *Goghari* from the Surat tract The anti-*Goghari* poster "Get rid of the weight," placards, etc, were used with much advantage during the campaign Only partial success, however, attended these efforts as owing to its higher ginning percentage, *Goghari* was mixed with Surat 1027A L F and the mixture was passed off as genuine *Navsari* In order to put a stop to this malpractice, legislation

was introduced in the Bombay Council and passed* prohibiting in any notified area the cultivation of Gogkari cotton its mixture with any other cotton and the possession, use or trade in such cotton either alone or mixed with other cotton.

Fifteen press *communiquees* were issued two of which dealt with the development of cotton growing in Sind and the Bombay Presidency and one with the improvement of cotton in India.

Besides the special articles and pamphlets issued from time to time the Department also participated in the Rural Life Exhibition at Baroda organised in celebration of the Diamond Jubilee of H. H. the Maharaja of Baroda the All India Industrial Exhibition, Delhi the Fair in Rajputana the Crop Demonstration at Amravati and Yavatmal and the Fair and Demonstration at Warora in the Central Provinces.

PUBLICATIONS

24. The Committee receives partly by subscription and partly on an exchange basis a number of important scientific and technical journals which are circulated to research workers under the Committee. This arrangement not only effects economy but also affords to the Committee's research workers an opportunity of perusing varied and up-to-date scientific literature which otherwise would not ordinarily be available to them.

The Committee desires to express its indebtedness to those institutions on whose free mailing list its name has been placed. Particular mention may be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs the Empire Cotton Growing Corporation the British Cotton Growing Association the East India Cotton Association and the Karachi Cotton Association for the supply of their publications for distribution to members. The Committee has also to record its thanks to the Indian Trade Commissioner London the U.S.A. Department of Agriculture the Egyptian Ministry of Agriculture Technical and Scientific Service the Liverpool Cotton Association the Lancashire Indian Cotton Committee the Imperial Bureau of Plant Genetics Cambridge the Textile Institute Manchester the Imperial Institute London the Indian Statistical Institute Calcutta the National Institute of Science Calcutta the Academy of Sciences and other Associations and Chambers of Commerce for supplying it with reports statistics and other literature from time to time. The Committee is also on the free exchange list of the Imperial Council of Agricultural Research the Imperial Institute of Agricultural Research Delhi, and the Director General of Commercial Intelligence and Statistics Calcutta.

SECRETARY'S TOURS.

25. The places visited by Secretary between the 1st September 1935 and the 31st August 1936, in connection with the work of the Committee were —

Mirpurkhas, Oderolal, Sakrand, Sukkur, Lloyd Barrage, Almani Johi and Dadu in Sind, Parbhani, Nandapur, Nanded, Latur, Chikurda, Ardhapur, Hadgaon, Basar and Madhol in the Hyderabad State, Coimbatore, Perundurai, Tiruppur and Ootacamund in the Madras Presidency and Indore and Delhi

FINANCIAL.

26. In *Appendix X* will be found a statement showing the Receipts and Expenditure of the Committee and also the Balance Sheet for the year ending 31st March 1936. Receipts amounted to Rs 10,12,740, and expenditure to Rs 11,40,629.

With the separation of Burma from India under the new constitution, the cess hitherto collected from that Province will no more be available to the Committee; this loss, however, will to some extent be compensated for the fact that the Committee will not be called upon to sponsor cotton schemes in that Province after separation

CHAPTER III

STATISTICS

27 Cotton being one of the principal money crops of the Indian agriculturist and cotton manufacture one of the most important industries of the country, it is inevitable that the Committee should devote much of its attention to the improvement, preparation and publication of cotton statistics. The following paragraphs deal with the work done under this head during the year

28. *Cotton Crop Estimates*—As usual cotton crop estimates were wired by the Director General of Commercial Intelligence and Statistics Calcutta, to the Secretary Indian Central Cotton Committee with a view to their simultaneous publication at Bombay and Calcutta. This arrangement has now been in force for the last six years and from the trade point of view its institution has been amply justified.

A comparison with the previous year's figures shows that the area under cotton in India increased from 24 023 000 to 25 138 000 acres the highest since 1920-30 when it was 25 022 000 acres. The firm price level for cotton in the preceding year coupled with the comparatively favourable sowing conditions in the cotton growing tracts partly contributed to the increased acreage. The total estimated yield for 1935-36 was 5 728 000 bales of 400 lbs. each as against 4 839 000 bales for 1934-35 the yield being nearly as high as that in 1928-29 when it touched 5 782 000 bales of 400 lbs. each. Favourable weather conditions during the season under report were responsible for the improvement in the average yield per acre which was 91 lbs. in 1935-36 against 81 lbs. in the preceding year the highest average in the last decade being 93 in the year 1927-28.

The fillip to cotton cultivation in India given by the opening of the Sukkur Barrage and Canal systems in 1932 is demonstrated by the fact that during the year under report the cotton area in Sind touched the record figure of 844 000 acres as against the ten year average of 321 000 acres during the pre-barrage period. Of the acreage for 1935-36 385 000 acres were under long and medium staple American strains.

29. *Improvement of Cotton Forecasts*—A practical step towards tackling the problem of improving the accuracy of the cotton forecasts of India was taken by the Committee in 1934 when it sanctioned a scheme for the improvement of the cotton forecasts of the Bombay Presidency and Sind (including Indian States) for two years at an estimated cost of Rs. 11 694. The object of the scheme which incidentally embraces roughly one-fourth of the area under cotton in India is to probe into the sources of the inaccuracies in the different factors used in the computation of the forecasts and to suggest measures for their rectification. As the sanctioned period of two years was found to be insufficient to cover the entire field the scheme

was extended by three years up to 15th June 1939, at an additional cost of Rs 16,500. During the year under report a recurring error which was rectified was found to be the adoption in the forecast estimates of several Indian States in the Bombay Presidency of a standard for a normal crop in terms of *annawari* different from that in vogue in British India. Further, in the absence of standard yield figures for some Indian States, those for adjoining British districts have been followed and this procedure was found to constitute a source of error in the cotton forecasts of some of the States. With a view therefore to formulate independent standard yield figures to replace those now used efforts were made to obtain actual yield figures and other relevant data for some of the States over a series of years. As regards the Deccan (excluding Khandesh), an examination of the available statistics revealed the desirability of adopting separate standard yield figures for cotton in irrigated and non-irrigated areas, and it is accordingly proposed to prepare the forecasts of 1936-37, on this basis.

One of the factors adversely affecting the accuracy of Government cotton forecasts in India is the lack of exact information regarding the quantity of *kapas* (seed cotton) and loose (ginned but unpressed) cotton which is consumed chiefly in villages for such domestic purposes as hand-spinning, making of quilts, mattresses, cordage, etc., such extra-factory consumption is roughly estimated at 750,000 bales for the whole of India. To arrive at a more reliable estimate of the extra-factory consumption, local enquiries were conducted in typical localities in different provinces and States with the aid of funds provided by the Indian Central Cotton Committee. Until all the reports are received and considered it is too early to say whether any alteration in the conventional estimate of 750,000 bales for extra-factory consumption can be recommended or whether further investigations will be necessary before a final decision is arrived at.

As a result of the *post-mortem* examination of the cotton forecasts of each season, the subject of the improvement of the cotton forecast is engaging the close attention of the authorities concerned to whom a forum for the exchange of views and discussion of common problems is afforded by the half-yearly meetings of the Cotton Forecast Improvement Sub-Committee. As a result of the critical examination of the sources of error in the cotton forecasts of past seasons tentative revised standard yield figures have been adopted for Sind and for parts of the Bombay Presidency. Crop-cutting experiments now under way in the British districts of the Punjab on a more extensive scale than before will, it is hoped, provide a more reliable basis for fixing the standard yield figures, while the institution in the Central Provinces and Berar of weekly ginning returns with effect from the season of 1935-36 has brought the problem of improving the accuracy of the cotton forecasts of that province nearer solution. In view of the under-estimation noticed in the cotton forecasts of the Mysore State in the past seasons, proposals for conducting crop-cutting experiments during 1936-37 to arrive at more accurate standard yield figures are under consideration by the State.

30 *Staple Length of the Indian Cotton Crop*—As usual a report on the estimated production during the season of Indian cotton of different staple lengths was issued in May. At the suggestion of the trade which was accepted by the Committee trade estimates were for the first time in this respect shown side by side with Government estimates. Whilst it is realised that the reconciliation of the Government with the trade estimates is not unattended with difficulty as the basis under which the two estimates are prepared are dissimilar its bearing on the problem of the accuracy of the Government cotton forecasts warrants its examination. The Committee warmly acknowledges the assistance which it has received from the trade in this connection.

31 *Press Statistics*—Since 1925 weekly returns of cotton pressed in British India have been collated by Provincial authorities under the Indian Cotton Ginning and Pressing Factories Act 1925 and forwarded to the Director General of Commercial Intelligence and Statistics for publication. To make the statistics of cotton pressed complete for the whole of India, the co-operation of Indian States in compiling and supplying similar figures for the States was enlisted and it is gratifying to record that all the sixty-seven States addressed have responded either by introducing legislation or passing the necessary executive orders. The expectation referred to in the previous year's report that press returns for the Gwalior State would be available from 1935-36 has unfortunately not materialised owing to certain administrative difficulties which however have since been overcome and it is hoped that the returns will be available from the 1936-37 season.

During the season 1935-36 4,321,384 bales were pressed in British India and 1,623,169 bales in Indian States making a total of 5,944,553 bales for the whole of India, the corresponding figures for the preceding season being 3,444,875, 1,100,939 and 4,545,813 bales respectively.

32 *Loose (Unpressed) Cotton Statistics*—The statistics of cotton pressed referred to in the preceding paragraph do not account for the whole of the Indian cotton crop as besides the cotton utilised for village or extra-factory consumption chiefly in the form of kapas for which as explained elsewhere efforts are being made to obtain a more reliable estimate mills situated in the heart of cotton growing areas use considerable quantities of loose (ginned but unpressed) cotton. To account for this the statistics of loose cotton received at mills in the major cotton growing provinces have therefore been obtained on a voluntary basis since 1926 and published. In 1935-36 264,000 bales of loose cotton were received at mills in the major cotton growing provinces of British India. The relevant figures for 1926-27 to 1935-36 are shown in Appendix XI to this report.

During the year under report the Government of India, on the recommendation of the Committee amended the form of monthly returns required to be submitted by mills under the Indian Cotton Cess Act as a result of which the quantities of pressed and unpressed cotton consumed

in mills have now to be shown separately in the prescribed returns. The Indian States concerned have also extended their co-operation by instructing the mills within their jurisdiction to furnish the information supplied voluntarily by them classified in a similar manner. The figures for unpressed cotton consumed in mills collected largely under statute will now ensure the publication of more accurate and complete information for the whole of India.

33 *Consumption* —As in the past, figures for the consumption of Indian cotton in mills in British India and Indian States were published monthly. The season's total consumption of Indian cotton in mills in India amounted to 2,677,572 bales of 400 lbs net and established a new record, breaking the previous year's record figure of 2,612,132 bales (*vide Appendix XI*). Compared with last year, the consumption of cotton in the Bombay Presidency showed a decline whilst Indian States, the United Provinces, the Central Provinces and the Madras Presidency all registered increases.

According to the figures published by the International Federation of Master Cotton Spinners' and Manufacturers' Associations the world's total mill consumption of Indian cotton, exclusive of Germany and Italy (for which figures are not available), showed a slight decrease from 5,414,000 bales during the year ending 31st July 1935 to 5,393,000 bales during the corresponding period of 1935-36.

34 *Exports* —The exports of Indian cotton during the season totalled 3,826,000 bales of 400 lbs each against 3,115,000 bales in the previous year.

35 *Stocks* —Up to 1933 reliable estimates of the stocks of Indian cotton held in mills and at trade centres in India on 31st August were not available except for the Island of Bombay. In view of the value of these figures to the trade as well as to the authorities in the Provinces and States responsible for preparing and checking the cotton forecasts, the Committee has been endeavouring since 1933 to collect the desired information on a voluntary basis through the co-operation of mills, trade associations, Cotton Market Committees and other official sources. Though the problem is not an easy one due to its wide ramifications, considerable headway has been made, and in course of time with an increasing realisation of the usefulness of these statistics, it is hoped, accurate and complete figures will become available.

The information collected in respect of the stocks held on the 31st August 1936, is contained in *Appendix XII*.

As regards the very late crops, *viz*, *Salems*, *Cambodias* and *Tinnevelles* of the Madras Presidency, the season for which is taken to be the year ending 31st January, the Director of Agriculture, Madras, has made arrangements to collect every year the stocks held on 31st January, by the trade in the respective tracts and by mills in the whole of the Presidency. The figures for the 31st January 1935 and 1936 are given in *Appendix XII*.

36. *Demand for various types of Indian Cotton* —Statistics of the export and Indian mill demand for the various types of Indian cotton are of considerable importance to those on whom falls the task of directing and shaping the cotton policy of India and the Committee has therefore for some time past been collecting the relevant data through direct enquiries on a voluntary basis. Further to enable the grower to realise the best value for his cotton it is essential that he should grow those types for which the demand is keen and these statistics therefore serve as a guide to him. The tables in Statistical Leaflets No. 3 and 4 Third Issues (1935-36) giving the results of the inquiry carried out in respect of exports and receipts at mills during 1935-36, are reproduced in Appendices VIII and VII.

37. *Publications* —The undermentioned publications were issued during the year under report —

- (1) *Statistical Leaflet No. 1 Third Issue (1935-36)* Report on the Staple Length of the Indian Cotton Crop of 1935-36 season."
 - (2) *Statistical Leaflet No. 2 Second Issue (1934-35)* Stocks of Indian raw cotton held in India by the mills and the trade on 31st August 1935
 - (3) *Statistical Leaflet No. 3 Second Issue (1935-36)* "Receipts at mills in India of raw cotton classified by varieties—1934-35 season.
 - (4) *Statistical Leaflet No. 4 Second Issue (1934-35)* Export by sea of Indian raw cotton classified by varieties—1934-35 season."
-

CHAPTER IV.

RESEARCH.

38 THE Indian Central Cotton Committee carries out its research policy by direct control of the Technological Laboratory at Matunga, Bombay, and by granting subsidies to Departments of Agriculture in provinces and States for the investigation of cotton problems mainly of an all-India importance or for large areas where cotton is an important crop. In addition the Committee contributes a large sum of money for the maintenance of the Institute of Plant Industry, Indore, where problems of fundamental, economic and agricultural importance are under investigation. The problems of research in provinces and States include, as explained in previous years, several schemes—botanical for breeding high yielding superior types of cotton, entomological for the study of the life-history of certain cotton pests and finding out measures to combat them, mycological for ascertaining ways and means to prevent loss due to wilt and root rot and physiological for the investigation of crop growth and bud and boll shedding. The Committee also provides liberal grants to Agricultural Departments and Co-operative Sale Societies for the extension and marketing of improved types of cotton and it has, in addition, undertaken jointly with the Imperial Council of Agricultural Research the investigation into the cost of the cultivation of cotton, sugarcane and their rotation crops in the principal cotton and sugarcane growing areas of India. During the year under report there were in all twenty-nine research schemes and seventeen seed extension and marketing schemes under operation, the total amount sanctioned for them being Rs 5,75,347-7-1 besides a further sum of Rs 3,91,663-4-10 sanctioned for the Technological Laboratory, Matunga, the Institute of Plant Industry, Indore, and the economic inquiry into the cost of cotton, sugarcane and their rotation crops. The Committee also offers scholarships and training grants for post-graduate training in India and abroad in subjects connected with cotton industry. All schemes, scholarships and training grants are first thoroughly examined and approved by the Agricultural Research Sub-Committee and the Technological Research Sub-Committee before they are finally sanctioned by the full Committee. It is also the function of these two Sub-Committees to examine the annual reports and keep the Committee in touch with the progress of each scheme.

TECHNOLOGICAL LABORATORY.

39 Details of the work carried out at the Technological Laboratory during the year will be found in the report of the Director which forms Chapter VI of this report. Whilst the resources of the Laboratory continued to be

availed of as in the past by agricultural officers in assessing the spinning value of their new strains, mills utilised to a much greater extent than in the past the facilities afforded by the Laboratory for the testing of their samples or the solution of their problems. The number of samples lots and yarns spun in the Spinning Laboratory during the year under report recorded an increase of 24·20 and 0·5 per cent respectively over the figures for the previous year. Samples are tested at the Laboratory under the following groups—(a) Agricultural samples (b) samples of standard Indian cottons (c) trade samples and (d) technological samples. (a) Agricultural samples represent either new or improved varieties under trial by Agricultural Departments and also some old types grown in connection with certain field experiments. The number of samples tested under this head was 330 against 251 in the preceding year. (b) The standard cottons mostly represent the improved varieties which now cover about 15 per cent of the total area under cotton cultivation in India and they at present include the following ten varieties—*Punjab-American 280F Verum 262* (Nagpur) *Verum 282* (Akola), *V 434* (Akola) *Late Verum* (Nagpur) *Uma Bani Punjab-American 4F Co 2* (Cambodia) *Sind Sudhar* and *Surat 1027 A.L.F.* The results of the tests on these cottons were published in four page circulars as usual. (c) The trade samples tested fall under two heads: (i) those supplied by the East India Cotton Association and which represent the fair average quality of different varieties of Indian cotton which form the bulk of the cotton crop and (ii) those supplied under arrangement with the Bombay and Ahmedabad Millowners Associations and which represent the early arrivals of the various Indian cottons into the local markets. Altogether 18 samples of the first category and 22 of the second were tested during the year and the results were published in 2 or 3-page circulars which were widely distributed to the trade and industry both in this country and abroad. A new feature introduced during the year was the compilation of all these circulars in the form of a bulletin for ready reference which was published for the first time under the title *Technological Reports on Trade Varieties of Indian Cottons* and which appears to have been well received. In addition to these tests samples received from individual mills and firms in their private capacity were also tested, as in the past, on payment of the fees prescribed by the Indian Central Cotton Committee. The number of such samples tested and reported upon during the year was 127 as compared with 39 in the previous year. This increase would seem to justify the conclusion that the practical value of the Laboratory is being gradually realised by the trade. Other investigations of interest to the trade completed during the year were the effect of different degrees of compression on the spinning quality of cotton, the effect of artificial watering on the spinning quality of cotton and the deterioration of cotton stored in the open and in sheds at Karachi. (d) Technological samples comprise those samples of cotton tested at the Laboratory in connection with certain research problems. A brief account of some of these will be found in the Director's report. Side by side with the work of the Spinning Laboratory problems are being investigated in the Research Section of the Laboratory, details of which are also given in the report of the Director.

The Moisture Testing Section carried out tests on 24 samples received during the period under review, 2 of which were on behalf of the Appeal Committee of the East India Cotton Association and 11 for the trade, the remaining 11 were in connection with Laboratory investigations

INSTITUTE OF PLANT INDUSTRY, INDORE.

40 The Annual Progress Report for the year ended 30th June 1936 of the Director, Institute of Plant Industry, Indore, with the exception of Section 10 which deals with crops other than cotton, is reproduced in *Appendix IV* of this report. The Institute which was established in 1924 with the object of providing a central research station for cotton in the black soil area of the Malwa plateau is maintained by annual contributions from the Indian Central Cotton Committee and the member States in Central India and Rajputana. Although the interests of the Committee are confined mainly to cotton and those of the States to specific crop problems of their own and the dissemination of more efficient agricultural practices, the interests of both parties are complementary and are harmoniously balanced in the work of the Institute. The Committee and the member States are represented on the Governing Body of the Institute in proportion to the grants made by them, in the financial year 1935-36, the Committee's contributions to the Institute amounted to Rs 97,600 against Rs 67,335 of the member States. On this basis, the Committee is at present represented by nine members on the Governing Body against 5 representatives of the States. The programme of work of the Institute covers the general botany, physiology and genetics of cotton, and in addition several agricultural investigations dealing with the cultivation of cotton and other crops are also carried out.

GRANTS-IN-AID.

SCHEMES IN PROGRESS IN PROVINCES AND STATES.

MADRAS PRESIDENCY.

41. *The Herbaceum Scheme* is [one of the oldest] schemes which commenced in 1923. Its original object was to obtain from local *Uppam* (*G. herbaceum*) suitable types to replace *Karunganni* (*G. indicum*) in 'Salems' and 'Tinnevelly' tracts where rainfall is low and uncertain. In years of good rainfall *Karunganni* gives a much higher yield than *Uppam* but in bad years the position is reversed, *Uppam* being a hardier variety capable of giving a fair yield even under adverse climatic conditions. The cultivator meets the situation by growing a mixture of the two cottons. The *Karunganni* strains which are now being distributed by the Agricultural Department are capable of spinning upto 26's warp counts against 14's of *Uppam* and the original intention of the scheme therefore was to produce one or more high yielding strains of *Uppam* which could spin at least upto

20a. It was however realised after 7 years work that the chances of obtaining pure strains from *Uppam* that would come up to the standard were few and the Committee therefore extended the scheme in 1930 for a further period of five years for securing by hybridisation what was not possible by unit selections.

The new line of work has already produced promising results. Of the two hybrid strains 4803 and 4714 reported last year as promising the latter has once again proved very satisfactory and that also in one of the most droughty and trying years experienced within the past two decades. In yield it has proved superior to *Korunganni* strains and it is capable of spanning upto 27a standard warp. It is also satisfactory from the point of ginning outturn, drought resistance and ability to withstand untimely February rains common to Salem and Tinnevelles tracts. It has however the disadvantage of being a narrow lobed variety which is likely to be mistaken for *G. roseum*. Attempts are being made to isolate broad lobed mutants which recur every year in this strain.

The work on purification of selections from other crosses was continued as usual.

42. *Pemphres* and *Physiological Scheme*.—This scheme seriously commenced work only in February 1935 though the preliminary investigations were started in 1931 pending the return of the two officers deputed for special training in England in plant physiology and bio-chemistry before they were appointed as Physiological Botanist and Bio-chemist respectively under the scheme. The principal object of the scheme is as finally decided by the Committee in January 1935 to minimise by breeding and physiological methods bud flower and boll shedding in *Karunganni* (*G. indicum*) caused by untimely rains and to devise control measures against the cotton stem borer, (*Pemphres affinis*), a serious pest in all Tamil districts (Tinnevelles Salem and Cambodia tracts) and to some extent in the Vizagapatam district. The incidence of the pest varies in inverse proportion to the length of the close period between two cotton crops and also cottons grown under drier conditions seem to suffer less than those receiving irrigation or intermittent rainfall throughout their growth period. Four species of parasites a Braconid and three species of Chalcids were found during the survey of the pest to parasitise the grub stages of the stem borer and no parasite has so far been observed on the egg pupa and adult stages. The four parasites put together do not seem to account for more than 5 per cent. of the mortality of the larvae but under favourable conditions the Braconid parasite may give better results.

The work of the year on botanical research shows that of the large number of varieties of cotton tested, only four viz., *Quebradinho*, *Verdado*, *Moco* and *Bourbon* suffered low mortality from the pest. Local varieties barring *Nadam* suffered more than 50% (Cambodia) when they were grown under similar conditions and their comparative freedom from the pest is

probably due to local rotations and late sowing. The most interesting feature of this year's observations is that *Quebradinho*, *Verdavo* and *Moco* produced gum more readily in the attacked parts killing the larvæ before they reached adult stage and emerged out of the plants. They are, however, late in maturing and poor in yield compared with *Co 2*, but they may prove useful for breeding tolerant types

The bio-chemical investigation shows that the gum formation in the attacked plants is due to the bacterial activity and is associated with the carbohydrate make-up of the plant. It has been further ascertained that the three varieties of cotton which produce gum readily are richer in water soluble polysaccharides in early stages of growth than the varieties that do not readily produce gums while the reverse is the case in the later stages. If these findings are confirmed the breeding work may become easier and more precise

43 *Fodder Cholam Scheme*—This scheme was started in 1931 with a view to ascertain the causes of the harmful effects of *Cholam* (*Andropogon sorghum*) as compared with those of *Cumbu* (*Pennisetum typhordeum*) on the succeeding crop of cotton in the black cotton soils of Tinnevely district and to find out suitable remedial measures in order that the cultivators of this district might have their *cholam* fodder without suffering any loss in the yield of the succeeding cotton. The results obtained during the year once again indicate that *cholam* does not exhaust soil any more than *cumbu* though in *cholam* soils clay contents tend to increase with the crop growth. The study on the changes in the cationic composition of the clay in soils was continued and the results once again show a general tendency to a rise of exchangeable sodium and corresponding fall in magnesium in *cholam* plots as compared with *cumbu* plots. Mention has been made in previous reports that the harmful effects of *cholam* crop on the succeeding crop of cotton are not noticed if the former is cut at the shot blade stage and that the prevention of grain formation by topping the plants at the flowering stage, by sowing the crop late and harvesting it at the shot blade stage at the normal harvesting time and by thick sowing results in low yield of fodder which the cultivators cannot afford. With a view, therefore, to find out a suitable mixture of *cholam* and pulse crops which could balance the deleterious effects of *cholam* without lowering the yield of fodder mixtures with black and green gram were tried during the year and their after-effects on cotton will be studied next year.

44 *The Nadam Cotton Breeding Scheme* commenced in February 1933, with the object of securing one or more suitable annual types of cotton to replace *Nadam* (*G obtusifolium*), a perennial variety in the red soil areas of Salem and Coimbatore districts where due to the poverty of soil and precarious rainfall neither *Karunganni* (*G indicum*) nor *Uppam* (*G herbaceum*) grows satisfactorily. *Nadam* being a perennial cotton serves as a breeding ground for

the stem weevil and pink boll worm during the close period of Cambodia proscribed by the Madras Pest Act, and if an annual variety suitable for light soils of the two districts is secured it will be possible to extend the Pest Act to the whole of Cambodia tract without exception and thus avoid damage to Cambodia cotton.

The work of the year under report gives again an indication of the possibility of securing suitable annual types which could replace Nadam. A large number of selections from Co 2 (Cambodia) and Nadam and crosses between Co 2 and Bourbon Co 2 and South African cottons Bourbon and South African cottons, Nadam and Karunganni and Nadam and Karunganni back crossed with Karunganni were tested and the results obtained from some of the crosses between Co 2 and U 4 (South African) and Co 2 and A 12 (South African) were quite encouraging. They yielded on small plots at the rate of from 240 to 260 lbs. of unginned cotton per acre against 60 lbs. in the first year 250 lbs. in the second year and 100 lbs. in the third year from Nadam. Cambodia also gave good results when it was given a spacing of 18×9 .

BOHRAI PRESIDENCY

45 *The Broach Cotton Breeding Scheme* which has now completed its fourth year has for its object the breeding of suitable types of cotton for the Nerbudda-Mahi zone with wilt resistant, heavy yielding high ginning and good spinning qualities to replace the local mixture consisting of a large percentage of Goghari a rough and short-staple variety, susceptible to wilt but with a high ginning outturn. Of the eight F1 to F5 crosses critically studied during the year 13 single plant cultures of B.D 8 \times G.A 26 F5 generation 33 of B.D 8 \times (B.D 8 \times G.A 26-F1) F3 generation and 6 of B.D 8 \times S 71 F3 generation have been found free from wilt attack. Some of these cultures were also fairly uniform for economic characters such as yield ginning outturn staple length and fineness of fibre. All these cultures will be further tested on a large scale next year for purity of characters. Most of the crosses examined last year were re-crossed with B.D 8 one of their parents with a view to increasing rapidly homozygosity for high wilt resistance and spinning qualities.

Of the single line selections N.S 13 maintained again its previous record of wilt resistance and other economic characters.

46 *Jalgaon Cotton Breeding Scheme*—This scheme, like the above commenced in April 1932 with a view to secure by unit selection or hybridisation suitable wilt resistant types with heavy yielding high ginning and good spinning qualities to replace local N.R and Banilla in Khandesh. Banilla is superior to local N.R in ginning outturn and spinning characters and gives better return to the cultivator. It is however susceptible to wilt and has also deteriorated in spinning quality since it was first introduced.

The three selections, *N V 57-7*, *N V 56-3* and *N V 56-17*, which were reported as promising last year, have maintained again this year their superiority almost in every respect over *Banilla*, *N R 6* and local *N R*. Of the three new selections, *N V 56-3* is better drought resistant and more vigorous in growth and also gives higher ginning outturn than *N V 57-7*, the next best. It spins up to 40's against 41's of *N V 57-7* and 35's of *N V 56-17*. The highest spinning capacity of *Banilla* varies from 10's to 15's while *N R* spins only upto 7's.

Many other new promising selections are under severe tests for wilt resistance.

47 *The Scheme for Survey of Goghari Cotton in Gujerat* is the outcome of the Committee's policy to establish 1027 *A L F* to the exclusion of all other varieties of cotton in the tract lying south of the Nerbudda. A seed scheme was accordingly started in 1934 for rapid expansion of 1027 *A L F*. Subsequent experience, however, revealed that to achieve the Committee's object within a reasonable time it was necessary to start a campaign against *Goghari*, an inferior short-staple variety which was favoured by ginneries because of its high ginning percentage. A separate scheme for the survey of *Goghari* cotton was therefore started in January 1935, with a view to trace this cotton to ginneries and induce their owners to discourage its cultivation by refusing to pay high prices for it. During the year under report 93 villages were surveyed in Jalalpore, Bardoli and Ankleshwar talukas and the results show that due to the active propaganda during the past two years there was a marked decrease of the area under *Goghari* this year except in a few villages in Ankleshwar taluka. The total area under *Goghari* and its mixture came down from 1,813 acres last year to 660 acres this year. The ginners also were more reasonable than last year and co-operated with the Department of Agriculture by ginning pure and mixed *Goghari* separately and disposing of the seed in such a way as it would not be used for sowing.

Now that legislation has been passed by the Bombay and Baroda Governments prohibiting the cultivation, mixing or possession of *Goghari* cotton in Gujerat and that it has been brought to the notice of the cultivators by intensive propaganda, it is hoped that this cotton will completely disappear within the next one or two years.

48 *Plant Puller Propaganda Scheme in Surat and Broach Districts.*—This scheme is the result of the Surat Boll-worm Clean-up Scheme sanctioned in 1930 for the purpose of bringing home to the cultivator in Gujerat the advantages of uprooting cotton stalks and stubbles before the end of May and thus depriving the pink and spotted boll-worms of the food material till the next crop of cotton. The clean-up scheme clearly demonstrated that by removing cotton stalks and stubbles in time the cultivator would obtain 25 to 30 per cent more yield and on the termination of the scheme in 1934

the Committee sanctioned the Plant Puller Propaganda Scheme with a view to popularise the cotton plant puller, a cheap and effective implement for uprooting cotton plants

During the year under report the propaganda work continued on the same lines as in previous years viz., by means of public lectures magic-lantern shows and practical demonstrations. Due however to severe damage to the cotton crop by frost in January 1935 and to the action taken by some of the cultivators to grub the damaged crop with the local harrow it was not possible to sell more than 739 plant pullers against 1,536 last year in Surat district and 2 271 against 3 441 in Broach district. The area uprooted was 56 000 acres or 20 per cent of the total area under cotton in Surat district and 143,296 acres or 62 per cent in Broach district

49 *Scheme for Defibration of Cotton Seed*—The installation of the defibrating machine having been completed in January 1930, preliminary tests were commenced in the latter half of February. The quantity of seed treated was only 6 720 lbs., but the results indicate that defibration of local seed is not an economic proposition. The experiment will be repeated next year

SIND

50 *The Sind Physiological Scheme* was commenced in July 1927 with the object of ascertaining the optimum sowing time and irrigation and manurial requirements of cotton so that the Department of Agriculture might be in a position to advise the cultivator authoritatively on these points by the time the Sukkur Barrage was opened. In 1932 it was definitely concluded that March 15th to May 15th was the optimum sowing period for cotton under irrigated conditions in Sind and the investigation of the remaining two points, viz., the irrigation and manurial requirements of cotton, was continued. The work of the year under report is again a repetition of what was done during the past two years and the results obtained are once more in conformity with those of previous years. The irrigation experiments show that water requirements of cotton are the highest during the flowering and fruiting periods and that an initial watering of 8 inches during the first 28 days followed in succession by two irrigations of 3 inches each at an interval of 20 days, three irrigations of 3 inches each at 15 days interval and five irrigations of 3 inches each at 10 days interval gives decidedly higher yield than the local method of 4 inches every 20 days after the initial irrigation of 8 inches or any other method of irrigation practicable under Barrage conditions

The manurial experiments have proved again that the application of manure to cotton is a profitable concern in Sind and that satisfactory returns can be expected when compost alone at the rate of 15 cart-loads per acre before sowing or compost at the rate of 7½ cart-loads per acre before sowing followed by ammonium sulphate at the rate of 50 to

100 lbs per acre $1\frac{1}{2}$ months to $3\frac{1}{2}$ months after sowing was applied. Best yields were obtained when the quantity of ammonium sulphate was increased to 200 lbs in addition to the basal application of compost.

PUNJAB.

51 *Botanical Scheme*—This scheme was started in 1925 with the object of enquiring into the causes of the periodic failures of *American* cotton in the Canal Colonies and obtaining suitable types of *American* and *Desi* cotton to replace the 4*F* and *Desi* cottons respectively. In view, however, of the immediate economic value of the improved types of cotton efforts are being concentrated on the problem of breeding and as will be seen below a separate physiological scheme has since been sanctioned for the investigation of the more difficult question of periodic failures of *American* cotton.

It was reported last year that after extensive trials under different conditions of soil and climate 43*F*, the best of the new *American* types, was finally selected for general distribution in place of 4*F*. During the year under report it again maintained its superiority over the three old types, 4*F*, 289*F* and *L S S* and gave satisfactory yields on an area of 6,000 acres under ordinary field conditions. It is expected to extend over 25,000 acres in 1936-37 season.

38*F*, another promising strain of *American* cotton, is gaining popularity in drier parts of the province where *jassid* is not a serious pest. It did well at Khanewal and also in Nabha State where in one *pargana* it is reported to have given a high average yield of 16 maunds per acre.

One other new strain of *American* cotton, 47*F*, which is still under final tests, appears to be superior even to 43*F* in respect of yield, ginning out-turn and hardiness and is capable of spinning upto 50's standard warp counts.

Of the *Desi* varieties, 39*M*, which was also issued last year for distribution to the cultivators, is reported to have given during the year satisfactory yields everywhere it was grown on commercial scale. A large number of pure line and hybrid strains are under final tests.

52 *The Physiological Scheme*, as mentioned above, has for its object the investigation into the causes of the periodic partial failure of the *American* cotton in the Punjab and it commenced work in March 1935. This failure was in the past attributed to heat stroke, unfavourable combination of climatic and soil factors, white fly and *jassid* attack and concentration of salts in the feeding zones of the roots, though none of these theories was supported by scientific data. The first symptoms of the complaint were the reddening and bronzing of the leaves at the reproductive stage and as

similar symptoms in other crops had been shown by various workers to be due to nutritional disorders the present investigation was commenced with manurial tests with magnesium, manganese and iron salts which gave no significant results. The next line of attack, viz. the study of the internal structure of the plant, has given some striking results revealing certain abnormalities in the leaf, stem and root which are probably responsible for defective boll-opening. In the case of the leaf the abnormalities may be summed up as accumulation of starch which is followed by the disintegration of the chloroplasts the production of excessive quantities of tannin and in the later stages the reddening of leaf due to the presence of anthocyanin pigments. In the root the first symptoms of abnormality is the brownian movement of very small particles which aggregate in cells and form colonies covered with yellow mucilaginous mass. Later on these masses darken in colour and increase in numbers. They are situated in the cortical region and in the phloem. Another change which takes place in the root cells is the formation of deposits in the cortex and the phloem which appear to be protein precipitates. Ultimately the whole of the tissue of the bark becomes filled with these deposits which extend into the medullary rays and the xylem parenchyma. The conducting channels for the translocation of plastio material are thus filled with the precipitates of proteins fats and tannins. Similar symptoms appear in the stem also.

53 Pink and Spotted Boll-worm Scheme—In 1920 the Committee sanctioned a Pink Boll worm Scheme with the object of ascertaining the causes responsible for the difference in the incidence of the pink boll worm between the Canal Colonies where it is practically absent and the South East Punjab where its attack on cotton is severe. The Pink Boll worm Scheme came to an end in 1934 when it was replaced by the present combined scheme viz. the Pink and Spotted Boll worm Scheme for the continuation of the work on the pink boll worm and the investigation of certain economic aspects of the spotted boll worm. The results of the Pink Boll worm Scheme have been given in previous reports wherein it has been explained that the unequal distribution of the insect is mainly due to the difference in temperature and humidity between different areas. The study of the spotted boll worm pest during the year under report shows that unlike the pink boll worm pest it is more severe at Lyallpur and Minian, representative of Canal Colonies and Western Punjab than elsewhere. The loss due to the pest this year is estimated from the results of the night caging experiments at 26 per cent. in *Desi* (local cotton) and 10 per cent. in *4P* (American variety) against 65 per cent. and 47 per cent. respectively last year.

It was mentioned in the last year's report that in the Punjab cotton sprouts from the previous year's stumps were the only source of food supply to the spotted boll worm for about six weeks from the middle of April. Further survey of food plants during the year under report shows that while this observation holds good so far as the Canal Colonies are concerned the

same cannot be said of the south eastern, central and sub-montane regions where in addition to cotton sprouts other host plants, particularly *Malva parviflora*, *Abutilon indicum* and *Malvestrum tricuspidatum* serve as breeding ground in the off season. It is thus evident that any clean-up scheme for uprooting cotton stalks and stubbles to avoid the boll-worm pest is not likely to yield satisfactory results unless the other host plants are simultaneously dealt with.

Of the three species of *Earias* (spotted boll-worm), viz, *insulana*, *fabia* and *cupreoviridis* met with in the Punjab, only the first two are cotton pests, the first being by far the commonest. *Insulana* is seen feeding on all host plants so far known in the Punjab while *fabia* is observed only on *Hibiscus esculentus* and rarely on other plants. *Insulana* and *fabia* remain active throughout the year while *cupreoviridis* hibernates in the form of pupa from October to April.

54 *The White Fly Scheme* was started in 1931 with a view to study the life-history of the white fly (*Bemesia gossypiperda*), a small sucking insect that does damage to cotton and other crops, and it came to an end in September 1936. The work of the year again confirms the results already obtained on the seasonal history of the pest. The most active period of the pest is from May to September and at the end of this period it migrates from cotton to alternative host plants like *Brassicæ*, *Solanum tuberosum*, *Lycopersicum esculantum* and various weeds on which it passes winter. From March to May it extends to cultivated cucurbits and ratoon cotton and goes back thereafter to the new cotton crop on which it establishes itself once again. Infestation was found higher again this year on *Mollison* than on the *Punjab-American* types and was reduced to some extent when ammonium sulphate was applied to the crop early in the season.

The chemical analysis of the affected and unaffected plants shows little difference in their nitrogen content till about the second week of July. Thereafter till the end of August the unaffected plants contain more nitrogen than the affected ones. The total quantity of nitrogen produced in a season in an unaffected plant amounts on an average to 1.20 grams against 0.95 grams in an infested plant and also the percentage of nitrogen transported from the vegetative to reproductive organs of the affected and uninfested plants is estimated at 12 and 20 respectively.

55 *Root Rot Scheme* — This scheme commenced in 1932 for the investigation of root rot in the Punjab, where, particularly in the canal irrigated areas, the annual damage done to cotton by this disease is estimated at Rs 16 lakhs. Both *Desi* and American varieties are equally susceptible to this disease which makes its appearance towards the end of June when the crop is 6-8 weeks old and continues up to the middle of September. The disease is, however, practically harmless on any cotton grown under rainfed conditions.

and its activity seems to vary directly in proportion to the number of irrigations or the amount of moisture in the soil. It affects cotton and many leguminous crops but cereal crops like *Maise* (*Zea mays*), *Bajree* (*Pennisetum typhoides*) and *Jowar* (*Andropogon sorghum*) are free from its effects though the causal organisms *Rhizoctonia bataticola* and *Rhizoctonia solani* are present on their roots. The two organisms are carried over from year to year in live as well as decayed roots unlike the American root rot fungus (*Phymatotrichum omnivorum*) which lives only in live roots.

There is no type of cotton, *Desi* or American in the Punjab at present which can resist the attack of root rot. Some of the plants of *Desi* and American types which appeared unaffected in a severely infected plot were selfed in 1931 and their progeny was tested in 1932. The results show that they were only escapes and not resistant to the disease. All the plants which looked again unaffected like their parents were selfed and each of them that had their roots free from the root rot organisms have been selected for further tests.

The physiological investigation of the two causal organisms give an indication that the application of ammonium salts might prove useful to minimise the disease but the results require further confirmation. Some interesting results have also been obtained from the study on the effect of temperature and hydrocyanic acid gas on *sclerotia*.

CENTRAL PROVINCES

56 *Botanical Scheme*—This is one of the Committee's earliest schemes sanctioned in 1923 for the purpose of obtaining wilt resistant, high yielding and fine spinning types of cotton suitable for the Central Provinces and Berar. This scheme unlike other schemes had the advantage of the cotton selection work already started by the Agricultural Department before it was sanctioned and it was therefore possible to obtain very soon a new type *Verum* 262 which looked at the time satisfactory from every point of view. It was however soon realised that this type being susceptible to adverse climatic conditions was unsuitable and attention was therefore directed to the selection of new strains free from this defect and if possible with better yielding and spinning qualities. The object has now been achieved and it is only a question of two or three years more when *Verum* 262 is completely replaced by three superior strains *V-434*, *Late Verum* and *V-439* which satisfy the needs of the different cotton growing areas of the province. They are also expected to replace the local short staple varieties wherever possible.

V-434 has proved its superiority over all other new strains in almost every part of the province under varied conditions of soil and climate. It is prolific, wilt resistant, quick in forming buds and setting bolls and

comparatively low shedding It has also good lint characters and high ginning percentage It spins upto 32's standard warp against 22's of V-262 and 10 to 12's of local cotton and fetches high premium on *Broach*

Late Verum suffered considerably during the year under report owing to the early cessation of the monsoon and the total absence of late rains. It is particularly suitable for areas where the monsoon lasts till late in the season It has nearly all the desirable characters of V-434 and spins upto 36's standard warp

V-438 is specially suitable for soils of lighter descriptions and is expected to cover soon a large area in Nimar district Its lint is almost as good as that of V-434

Of the other new strains under tests, *Buri A K* special and No. 107, the two American types, have done well again and there is already good demand for their seed from Nimar district and many places in Berar They spin upto 44's standard warp Work on *Bani* 306 and *E B* 31 (*indicum* types) continued on the lines of previous years Six new promising strains have been isolated from them and they are being tested for wilt resistance

57 *The Entomological Scheme*, which commenced in June 1934, has for its object the preliminary survey of the cotton boll-worm pest in the Central Provinces and Berar where it has been doing much damage to cotton with a view to ascertain its incidence, method of carry-over and the extent to which the results obtained from the Surat Boll-worm Clean-up Scheme can be usefully applied to this province The work of the past two years shows that three types of boll-worms, viz, the spotted boll-worm (*Earias fabia*), the pink boll-worm (*Platyedra gossypiella*) and the cotton boll-worm of America, locally known as gram caterpillar [*Heliothis (chloridea) obsoleta*], are the cause of much damage to the cotton crop in the province The spotted boll-worm makes its first appearance about the last week of July when the cotton seedlings are 6"—9" high and continues to feed on the crop till about the end of January, first on the tender shoots of seedlings and later on buds and tender bolls when they are formed During the year under report the population of the spotted boll-worm remained low till the middle of October and thereafter it began to increase till the end of November when it reached its maximum With the beginning of December the population began to decline gradually till it reached the lowest level at the end of January As the time of boll development coincides with the maximum increase of the population of the spotted boll-worm the damage done to cotton by this insect is serious

The pink boll-worm is not, on the other hand, a serious pest in the Central Provinces and Berar It appears from September onwards and its maximum population is reached sometime in January As the pink boll-worm, unlike the spotted boll-worm, prefers mature bolls to buds and

tender bolls and also as its maximum population is reached when all the cotton pickings are over the damage done by this insect is not serious

The gram caterpillar was hitherto unknown in India as a cotton pest and it has been found out this year for the first time that the damage done by it to cotton in Bihar is as serious as that of the other two boll worms. Like the spotted boll worm, the gram caterpillar begins with boring the tender shoots of cotton seedlings and attacks later on buds and young bolls when they are formed. It continues damaging the crop till about the end of October when the bud formation is at its height and disappears thereafter temporarily till November when it again makes its appearance on the gram crop.

As regards the carry-over of the three boll worms the last picking of cotton is usually over by the month of January and there is an interval of nearly six months between the old and next new crop. The boll worms have however no difficulty in tiding over this period as according to the local practices of cultivation cotton plants in many localities are not removed off the fields till about the middle of May. In May and June the supply of food in cotton fields becomes scarce and during this period they live on the available alternative food plants such as *Hibiscus esculentus* *H. pandura* *formis* *H. cannabinus* *Abutilon* spp. hollyhock and perennial cotton trees.

The foregoing account shows that the position of the boll worm pest in the Central Provinces and Bihar is about the same as in Gujerat and the only practical way of controlling it is to adopt clean up measures similar to those adopted in Gujerat viz. the uprooting of cotton stalks and stubbles and eradication of alternative host plants as early as possible after the harvest of cotton.

UNITED PROVINCES.

58 *The Cotton Survey Scheme* commenced in 1933 with a view to carry out a detailed survey of the *Bengals* types of cotton grown in Rohilkhand and Bundelkhand to facilitate the selection of suitable types of cotton for the different cotton growing areas of the province. The survey was continued during the year in Moradabad Naini Tal and Bijnor districts of Rohilkhand Division and representative samples were collected from no fewer than 2479 villages. The examination of these samples show that the pre-dominating type of this tract is a narrow lobed yellow flowered variety with varying quality of lint. White-flowered variety is comparatively rare and broad lobed white-flowered type is rarer still. 1,321 of these samples have been retained in a preliminary selection and only the promising few of them will be tested next year.

The single plant cultures of the selections made out of the material collected in 1933 from Rohilkhand districts were tested during the year

and all promising plants were selfed and their ginning percentages were worked out. The unselfed plants of all cultures were also picked and examined for quality of lint and the best of them were retained for testing their ginning outturn next year. A large number of single plant cultures selected out of the material obtained in 1934 from Bundelkhand districts and adjoining States were likewise tested and all the promising plants were selfed for further tests.

BENGAL

59 *The Comilla Cotton Scheme* has for its object the botanical and systematic study and improvement of the commercial grade of *Cernuum* cotton and was started in December 1934. The work of the year mainly consists of testing the field and commercial characters of the single plant selections obtained last year from different types of *Comillas* and Assam cottons and making as in last year further selections from the cultivators' fields. Reciprocal crosses were also made with two local types and *Garrow Hill No 6*.

BURMA

60 *The Cotton Improvement Scheme* was started in April 1931, with the object of bringing home to the cultivators of the *Wagale* tract, by means of practical demonstrations, the better methods of cotton cultivation. The Committee provides funds for the employment each year of not more than 24 demonstrators and for the purchase of the necessary implements for demonstration. During the year under report there were 24 demonstrators in charge of 71 demonstration holdings in the four cotton districts of Meiktila, Myingyan, Sagaing and Lower Chindwin. These holdings, in most cases, are producing conspicuous effect and the improvement obtained in many of them after a few years' working is quite encouraging. During the year under report the average yield for the demonstration holdings exceeded the average for Meiktila and Sagaing districts by 39 per cent, for Myingyan by 51 per cent and for Lower Chindwin by 47 per cent. Also the drill-sown area, the number of seed drills and bullock cultivators in use, the number of cultivators conserving manure and the area under improved layout have considerably increased since 1931 when the scheme was started.

HYDERABAD

61 *The Botanical Research Scheme* commenced in 1929 at Parbhami with a view to obtain a few prolific high ginning uniform types of cotton with good spinning qualities to replace the present mixture of *Gaorani* cotton in Hyderabad State. *Gaorani* or *Bani* is probably the best of the indigenous cottons from the point of spinning. It is, however, poor in yield and ginning outturn and but for the timely steps taken by the Local Government to prevent its further deterioration it should have been, by now, completely replaced by inferior varieties of short staple high ginning *neglectums*.

The work of the year mainly consists of testing old and new strains and making new single plant selections from *Gaorani* mixture and short staple

varieties. There were four varietal tests two for the comparison of *Gaurani* or medium staple strains intended for the *Gaurani* tract and two of short staple strains for the short staple areas of Larkhani and Aurangabad districts. In one of the first two tests which was repeated at Larkhani, Nanded and Mulbol the combined results show that all the oil strains tested viz. *O 4*, *O 6*, *O 22* and *P 25* are almost equal to one another in yield and superior to the local *Gaurani* mixture in every respect. In the second test at Larkhani with the exception of *O 6* and *O 62* all oil strains viz. *O 4*, *O 22*, *P 1*, *O 22*, *E* and *P 25* gave higher yields than the same control (*Gaurani* mixture). *O 6* an early maturing variety suffered more than oil or varieties from abnormal weather conditions and heavy leaf worm attack. In the remaining two tests *Harni 3* a coarser strain, proved again a better yielder than all other strains tested. There were two other similar tests between a large number of new strains and a few old ones. The results show that of the 29 new *Gaurani* strains tested four viz. *O 4*, *H*, *O 4*, *H*, *O 4*, *H* and *O 22*, *A* are likely to prove satisfactory while none of the new short staple strains come up to the level of *Harni 3*.

O 4 and *O 6* which have given very promising results in comparative trials during the past three years were tested this year side by side with *Gaurani* mixture as control in cultivation field. *O 4* failed for some reason or other to compare satisfactorily with the control while *O 6* fared better. *O 4* and *O 6* were also tested on a comparative scale in 1931 and 1932 respectively in Nanded district. Here also *O 4* failed to come up to the expectation while *O 6* gave satisfactory yield. *O 4* and *O 6* spun up to 33s and 40s warp count respectively.

102. *The Pink and Spotted Boll worm Scheme* was started in January 1933 with a view to ascertain (a) the actual amount of damage done to cotton in the Golarary valley by the boll worm pest (b) the progress of its attack on the growing crop (c) the mode of its carry-over from season to season and (d) the effect of the likely control measures. The work of the year under report is more or less a repetition of what was done during the last year and consists of (a) a survey of the incidence of the boll worm attack and damage done by it to the harvested crop and (b) the study of the behaviour of the full fed larvae of pink and spotted boll worms and the manner the boll worm pest is carried over from one season to the next. The results show that as observed during the last year the spotted boll worm is practically never absent and rapidly increases in numbers in September and October when the weather conditions are favourable. The maximum incidence of its attack is attained in December. It commences to decline thereafter till about the middle of January when it again starts increasing. It lives during the off season on cotton plants left over in fields and on alternative host plants and pupates in cotton and other food plants, in their shed parts and in the soil. The damage done by the spotted boll worm during the year amounted to 10 to 28 per cent of buds, 20 to 58 per cent of green bolls and 7 to 8 per cent of bolls.

The pink boll-worm pest makes its first appearance from June onwards and reaches its maximum incidence in January-February when it begins to decrease till it becomes negligible at the end of April. It continues as short cycle larvæ on "stand over cotton" till the beginning of May. Thereafter it spends a short time in the quiescent stage and emerges as long cycle moth on the return of favourable weather after the setting in of the South-West monsoon. The long cycle moth finds ready breeding ground in the previous year's crop still left in the fields in many localities due to the local practice of delaying the annual leases of cultivated land till the middle of April. The pink boll-worm passes its resting stage in the stored seed cotton and in the soil and unlike in the United Provinces it does not survive in the stored seed. The damage done by this insect is estimated at 14 to 35 per cent of the yield.

The gram caterpillar, *Heliothis (Chloridea) obsoleta*, which has been found to be causing much damage to cotton in the Central Provinces and Berar, has not yet attracted much attention in Hyderabad State.

BARODA.

63 *Root Rot Scheme* — This scheme was started in February 1932 with the double object of studying the root rot disease and securing a few suitable strains of cotton which are resistant to this disease. The work of the past four years shows that the disease is less severe in years of normal rainfall than in years of high rainfall and also in late sown crop than in early sown crop. The affected cotton roots contain the organisms of *Macrophomina phaseoli*, *Nemas* and some *Fusaria* which are also found in several other crops and weed plants suffering from similar disease, but the infection experiments show that while the first two organisms are the real cause of the disease, the *Fusaria* are practically harmless. The activity of *Macrophomina* begins at 30° C and reaches optimum at 36° C. Sucrose appears to be helpful to its growth while ammonia has retarding effect, but *Sclerotia* (resting spores) produced luxuriant growth when they are exposed to liquor ammonia even for ten days. They are however killed when exposed to formaldehyde.

On the Botanical side, five selections, viz, *KS*, *BS*, *DS*, *No 8* and *No 9*, are found more resistant to root rot than the control and no significant difference has been noticed between themselves, though *KS* looks a little more promising than the rest.

64 *The Goghari Cotton Survey Scheme* is similar to the *Goghari Cotton Survey Scheme* in the Bombay Presidency and has for its object the survey of *Goghari* cotton crop in Baroda State, with a view to trace the produce to ginneries and induce them to gin it separately and dispose of the seed for cattle food. During the year under report the survey was again confined to the same four talukas that were dealt with last year, viz, Navsari, Mahuva, Palsana and Gandevi, though the number of villages was increased to 118.

from 95 of last year. The total area surveyed was about 55 000 *bighas* (32,353 acres) belonging to 6 409 cultivators and only 8% of the latter all in Navsari taluka were found growing *Goghari* as more than 5 per cent mixture. Nowhere in the remaining three talukas did the *Goghari* mixture exceed 5 per cent, while in Gandevi taluka the entire cotton crop was practically free from it. A list of the names of cultivators who grow more than 5 per cent mixture was circulated to the ginowners who had undertaken to gin such cotton separately and sell the seed for cattle food. The Bombay Cotton Control Act has been applied to the Baroda State with necessary modifications and omissions to meet the requirements of the State. This will it is hoped effectively check if not completely eliminate the menace of *Goghari*.

65 *Plant Puller Propaganda Scheme*—This scheme which commenced in January 1930 is identical with the Plant Puller Propaganda Scheme in the Bombay Gujarat and is meant to popularise the cotton plant puller a cheap and effective implement for uprooting cotton stalks and stubbles and thus encourage the cultivators to fight against the boll worm pest by cleaning up their cotton fields as soon as the last pickings of *kapas* (seed cotton) were over. The work was started in Baroda and Navsari districts on the same lines as in Broach and Surat districts of the Bombay Presidency and as a result of intensive propaganda it was possible to distribute 3 000 plant pullers in Baroda district and 577 in Navsari district. The demand in Baroda district was so great that it could not be met by the manufacturers and many more plant pullers would have been sold if they had been available. In Navsari district, on the other hand the demand was low due to the propaganda being started late and also to a feeling among the cultivators that by uprooting cotton plants the physical texture of the soil is interfered with the low demand was also due to the plant pullers being purchased in the adjoining villages of the Bombay Presidency by some of the cultivators.

BIKANER.

66 *The Gang Canal Scheme*—The opening of the Gang Canal under the Sutlej Valley Scheme resulted in the colonization of a new and practically uncultivated area now known as the Gang Canal area with immigrant peasants mostly from the Punjab who had been accustomed to the cultivation of the Punjab *Desi* and American types of cotton. The local conditions being different from those obtaining in the Punjab with regard to the supply of irrigation water which proved uncertain, it was feared at one time that the area under cotton would be seriously reduced. It was therefore considered necessary to sanction this scheme for the purpose of studying the local problems of agriculturists and obtaining by selection or hybridization one or more superior types of cotton suitable for the locality. The scheme was started in January 1931 and the work of the past five years clearly shows that due to their low yield and susceptibility to diseases American varieties are unsuitable for the area under the existing conditions of cultivation and

that *Cawnpore 520 (Desi)* is the most profitable variety to grow in this locality *Cawnpore 520* is superior to *Mollisoni (Desi)* in every respect and arrangements are being made for the multiplication and distribution of its seed. It gives best results when it is sown in the middle of May though its sowings could be extended till the latter part of June without any loss in yield, June sowings however slightly lower the ginning outturn. It also does not require much watering and gives normal yield with as few as four irrigations when they are suitably adjusted. It will thus be seen that the usual short supply of water in the hot weather need not prevent the cultivators from sowing as much cotton as they wish on the water then available.

MYSORE

67 *The Doddahathi (American) Cotton Scheme* was sanctioned in February 1935 for the purpose of breeding suitable types from the local *Doddahathi* or American cotton, resistant to "Red Leaf" disease which stands in the way of the expansion of this crop in the Irwin Canal area in Mysore State. The work of the year in the Central Laboratory, Bangalore, indicates that *Co 2 (Cambodia)*, *Gadag No 1*, 295-F-21, *Ashmouni-37* and *Uganda* varieties are more susceptible to "Red Leaf" than 4-F 98, *Sea Island, Co 1*, *Boss III-16* and *Aiboreum* varieties and crosses between *Ashmouni* and *Peruvvum*, 4-F 98 and *Peruvvum* and *Sakel* and *Peruvvum*. At the Irwin Canal Farm 38-F, 4-F and *M A II* were sown from the 1st May, at 15 days' intervals with a view to find out if there was any relation between the disease and the time of sowing. The results indicate the existence of such relation. A large number of crosses was made during the year between exotic, indigenous and wild varieties and the behaviour of their progenies to "Red Leaf" will be studied next year.

CHAPTER V

SEED DISTRIBUTION SCHEMES

69 During the first five years of its existence the Committee devoted itself chiefy to botanical and other research on cotton but in 1929 it felt that if its work was to be of practical benefit the results obtained by research should be made easily available to the cultivator. In this year therefore the Committee adopted the policy of helping Agricultural Departments and Co-operative Societies in the more extended distribution of pure seed of improved varieties of cotton. Since 1929 twenty seed distribution and extension schemes have been sanctioned and of these 17 are at present in operation. Three of the sanctioned schemes for one reason or another never started, one of these has since been withdrawn and the other two have been merged in a larger and more comprehensive scheme. A short account of these schemes is given below.

MADRAS PRESIDENCY

69 *The Tiruppur Co 2 (Cambodia) Seed Extension Scheme*—The Madras (Tiruppur) Seed Extension Scheme was sanctioned in 1929 for a period of five years with the object of providing for the pay of an officer to act as an adviser to a group of Co-operative Societies in Coimbatore District who were growing improved strains of Cambodia cotton and also to help the Agricultural Department in their seed distribution work. It started work in May 1931 and was extended in June 1935 for a short period of three months. This scheme was amalgamated in 1933 with a new scheme known as the Tiruppur Co 2 (Cambodia) Seed Extension Scheme which was sanctioned in August 1932 for a period of five years for the distribution of Co 2 seed in the Salem and Coimbatore districts through the agency of the Madras Agricultural Department and the Tiruppur Co-operative Trading Society. The object of the second scheme was the maintenance by the Agricultural Department with a grant from the Committee of a seed multiplication area of not less than 6 000 acres and the distribution by the Society to the cultivators of the pure seed produced in this area for 100 000 acres. The Committee has further guaranteed the Tiruppur Co-operative Trading Society its actual loss on seed transactions up to a maximum of 10 per cent of the capital invested for the purchase of seed and interest thereon at 5 per cent. In 1934-35 the cotton crop in Tiruppur was so badly affected by pests and adverse climatic conditions that it gave only a poor average yield of about 420 lbs of *kapas* per acre. The total quantity of pure seed obtained from the multiplication areas and selected cultivators was 1,348 171 lbs of which only 1 009 471 lbs were sold for sowing in 1935-36 the rest being disposed of as cattle food.

In 1935-36, the Department of Agriculture issued pure seed for 6,249 acres of seed multiplication area, but due to the failure of rains and the inadequacy of water in wells at the sowing season, the cultivators utilised it for 5,320 acres only by sowing at a higher seed rate. For the same reasons the yield of cotton is not expected to exceed 280 lbs per acre. That *Co 2* is appreciated both by the *ryots* and merchants is evidenced by the fact that the natural spread of this variety of cotton exceeded 120,000 acres during 1935-36 in addition to the seed multiplication areas. The premium obtained per *candy* of 784 lbs of *Co 2* cotton over local *Cambodia* ranged from Rs 7/8 in September 1935 to Rs 12 in November 1935.

BOMBAY PRESIDENCY

70 *The Hubli Seed Extension Scheme* —The scheme was sanctioned in November 1929 for a period of five years. It commenced work in June 1930 and was extended for one year from the 31st May 1935. It has since been merged in the revised scheme for the extension of *Jayawant* and *Gadag 1* cottons in the Southern Division of the Bombay Presidency. Under the original scheme it was intended that the Department of Agriculture with the aid of a grant from the Committee should maintain a seed multiplication area of about 15,000 acres of *Jayawant* cotton and the Hubli Co-operative Cotton Sale Society should distribute the seed thus obtained to cover about 200,000 acres. In so far as the Society was concerned, the Committee agreed to make good to it any losses in its seed business up to a maximum of Rs 5,000 every year and to pay interest at 5 per cent on the capital invested for the purchase of pure seed. The Committee further granted the Society a loan of Rs 7,629, free of interest, to be recovered from the profits in the seed transactions. During 1935-36 the Department of Agriculture maintained a reserved area of 25,377 acres but the area covered by the Society did not exceed 143,800 acres, a figure much below the stipulated area of 200,000 acres. Out of about 1,600,000 lbs of seed expected from the reserved area 1,100,000 lbs were stocked for distribution in 1936-37. During the season 1935-36 the yield of *Jayawant* cotton was reduced by 25 to 30 per cent on account of unfavourable weather, inadequate soil moisture and mist and rains during the picking time in some places. The average price obtained for *Jayawant* cotton was Rs. 11 more per *naga* (1,344 lbs) of seed cotton than for the local cotton. It has been estimated that as a result of the operation of the scheme from 1930-31 to 1935-36 the total gain to the growers of *Jayawant* cotton in Dharwar district alone comes up to Rs 6 lakhs per annum.

71 *The Gadag Seed Extension Scheme* —This scheme which started in June 1930 is almost identical with the Hubli scheme except that the type of seed intended for distribution is *Gadag No 1* and the seed multiplication area is 24,400 acres, whilst the work of distribution is done by the Gadag Co-operative Cotton Sale Society. The Committee also granted the Society a loan of Rs 7,292 free of interest to be recovered from profits in seed

transactions. In 1935-36 the Department of Agriculture maintained a reserved area of 23,209 acres and handed over to the Society 1 250 892 lbs pure seed of which 830 030 lbs enough to cover 83 693 acres were distributed in the area reserved by it. Early in 1935-36 the crop held out good prospects but later deterioration set in due to unfavourable weather conditions. The average premium paid for *Gadag 1* over pure unmixed *Dharwar American* amounted to about Rs. 25 per bags or Rs. 3 per acre. The total gain to the growers of *Gadag 1* cotton in Dharwar district has been estimated at Rs. 4 lakhs annually during the past six years.

72. *The Athani Seed Extension Scheme*—The main difference between this scheme and the previous two schemes is that this scheme was run entirely by the Agricultural Department whereas the first two were conducted partly by the Agricultural Department and partly by the Cotton Sale Societies. The Athani Seed Extension Scheme which has for its object the extension of *Jayawant* seed in the Athani Taluka of Belgaum District was sanctioned in December 1931 for a period of five years and commenced work in April 1932. During the year 1935-36 the Department of Agriculture was able to distribute to cultivators 310,293 lbs of *Jayawant* seed to cover an area of 31 028 acres and maintained a seed multiplication area of 5 817 acres from which 2,000 lbs of pure seed were secured and stocked for distribution in 1936-37. *Jayawant* cotton obtained from the reserved area, fetched a premium of Rs. 2 8 to Rs. 3 per 40k of 200 lbs of *kapas* over local cotton. The extra gain to the growers of this cotton has been estimated at Rs. 81 033 annually. The Athani scheme has worked so satisfactorily that it has formed the basis of the new seed multiplication scheme viz. the Revised *Jayawant* and *Gadag No. 1* Scheme for the whole division which was started in June 1936.

73. *The Revised Jayawant and Gadag No. 1 Scheme*—Five separate schemes were sanctioned by the Committee in 1929 for the distribution and extension of *Jayawant* and *Gadag No. 1* cottons in the Southern Division of the Bombay Presidency. These were the Hubli Gadag Athani Haveri and Ballhonga Schemes. The last two schemes could not be started for several reasons whilst the first two indicated certain defects in their working which stood in the way of their continuance after the expiry of their sanctioned periods. The revised scheme is designed to embrace not only the areas covered by the five schemes mentioned above but also other areas in Dharwar Belgaum and Bijapur districts for which there were no specific schemes. The revised scheme will be operated from seven centres viz. Hubli Haveri Navalgund Ballhonga Athani Bijapur and Bagalkot through the agency of Co-operative Societies but under the general control of the Agricultural Department. Societies agreeable to the conditions imposed will receive a subsidy not exceeding annas 6 per bag (140 lbs) to meet handling charges and losses incurred by them. The keynote of this new scheme which came into operation in June 1936 is decentralisation so that no single agency should have too great an area to cover or too great

a responsibility to carry This scheme has been sanctioned by the Committee for a period of five years at an estimated expenditure of Rs 2,66,772 of which a sum of Rs 88,332 represents the savings of the original five schemes referred to above Sanction to the scheme is subject to the condition that the Government of Bombay should bear 25 per cent of the net additional cost but as the Local Government have agreed to bear their share of the cost for a period of one year only, pending settlement of the question of the policy to be adopted by the Committee regarding the apportionment of the cost of schemes financed by the Committee during their extension periods, the revised scheme will be in operation for a period of one year only in the first instance

74 *The Surat Seed Distribution and Extension Scheme* — This scheme was sanctioned in 1929 for two years and extended for two more years in 1931 pending the decision of the Committee on the merits of the two rival varieties of 1-A and 1027 *A L F* In January 1934 the Committee finally decided to confine its attention to the distribution of 1027 *A L F* only and extended the scheme for five more years Thus the scheme will continue till March 1939 Owing to severe frost in the middle of January 1935 and the consequent failure of the cotton crop over a large area in the Surat district, it was not possible to secure more than 1,118,906 lbs of pure seed of 1027 *A L F* but even all this quantity could not be distributed owing to the unreasonable attitude of the cultivators who attributed the failure of cotton to this seed, to the advice of a few money-lenders in favour of *Khandesh* cotton and to the difficulty experienced by farmers in finding ready money for the purchase of seed at the time of sowing The quantity distributed did not therefore exceed 905,539 lbs including the 289,616 lbs supplied to the Idar and Chhota Udepur States against the total distribution of 2,312,818 lbs during the last year The Agricultural Department maintained a seed multiplication area of 12,828 acres and the seed obtained from this area will be distributed for sowing in 1936-37 season

75 *The Khandesh (Banilla) Seed Extension Scheme* — This scheme, which has for its object the extension of *Banilla* cotton in the Khandesh area, was sanctioned in December 1930 for a period of five years and commenced work in May 1931 Proposals for further extension of the scheme for three years from May 1936 were considered by the Committee but its extension was sanctioned for one year only pending the decision of the Government of Bombay on the condition laid down that a part of the cost of the scheme during the remaining two years should be borne by the Government As a result of the scheme being in operation during the last five years the cultivation of *Banilla* cotton in Khandesh has extended over an area of 130,000 acres with a production of about 30,000 bales This cotton is susceptible to wilt and has also deteriorated in spinning quality since its introduction In spite of these defects, however, it is superior to local cotton and gives better returns In 1935-36 pure *Banilla* fetched a premium of Rs 10 to Rs 15 per *candy* over local cotton Spinning tests on *Banilla*

cotton carried out at the Technological Laboratory Matunga showed that *Banilla* grown on the Bhadgaon Farm gave slightly better results in 1935-36 than in 1934-35 while the same cotton grown on the Dhulia and Jalgaon Farms persistently declined in spinning quality during the last two years. During 1935-36 the Department of Agriculture maintained a controlled area of 20 112 acres and distributed for general cultivation 9 65 000 lbs of pure seed obtained from the previous year's crop

76 *The Deccan Canals (Banilla) Seed Extension Scheme.*—This scheme for the supply of pure *Banilla* cotton seed for the Deccan Canals area was sanctioned in January 1934 and started work in April 1934 in the Government Farm at Kopergaon. Unlike other seed schemes this scheme is expected to be self-supporting. Of the sixty acres of farm land taken on lease *Banilla* occupied in 1935-36 a little over 30 acres the rest of the area being cropped with Spanish peanut. Cotton suffered considerably from green caterpillars at early seedling stage and low rainfall and other adverse weather conditions subsequently and gave a total yield of 22,378 lbs of *kapas* i.e. at the rate of 733 lbs. per acre. All the *kapas* was ginned on the Farm and out of the total quantity of 10 700 lbs of pure healthy seed obtained 10 000 lbs. were distributed to cultivators and the balance was retained for sowing on the Farm in the following year. Groundnut gave an average yield of 1 030 lbs. per acre. In the irrigated Deccan Canals areas *Banilla* gives as high an yield as local *N.R.* and fetches a good premium over the local variety. The total area expected to be covered by this cotton is 30 000 acres.

77 *The B.D. 8 Seed Extension Scheme.*—This scheme for the distribution and extension of *B.D. 8* cotton seed was sanctioned in August 1935 for a period of 3 years and commenced work in December 1935. From a field survey undertaken by the Department of Agriculture at the beginning of the scheme it was ascertained that an area of 3,023 acres was under pure *B.D. 8* cotton which yielded 474,634 lbs. of pure seed and 252 032 lbs. of lint and the latter fetched a premium of Rs 40 to Rs 53 per *khandy* of 784 lbs of lint over *Broach* cotton. The difficulties in the way of expansion of this cotton are the tendency on the part of buyers to underestimate the value of its lint its low ginning percentage and the absence of a well organised cotton market for *Broach* staple cotton. Cultivators however are in favour of this cotton because of its high yield of *kapas* and wilt resistance.

SIND

78 *The Sind Seed Distribution and Extension Scheme.*—The Sind Cotton Extension Scheme commenced in April 1931 and on the expiry of its first sanctioned period of 3 years it was extended for a further period of 5 years. The work of the past five years has definitely proved that the Right Bank area of the Indus is as suitable as any other part of Sind for growing long staple cotton and it is now proposed to pay hereafter special attention to seed distribution, the introduction of better methods of cultivation and

the extension of cotton in lands under the Barrage area. Cotton cultivation was unknown on this side of the Indus before the commencement of this scheme but as a result of the intensive propaganda carried on by means of field demonstrations, shows, public meetings, etc. the area under cotton has now gone up to 17,000 acres against 4,000 acres in the previous year and 25 acres in 1931-32. During the year under report there were 40 demonstrator plots on the Right Bank area for the comparison of 4-*F* 98 and *Sind-Sudhar* (289-*F* 1) and contrary to the experience of previous years in most cases the latter gave better yields than the former. *Sind-Sudhar* is the better yielder of the two but being a late maturing variety it suffers more than 4-*F* 98 from frost. The year under report was milder than usual and was therefore quite favourable for *Sind-Sudhar*. The sowing date experiments showed that the best time for sowing cotton in this area is from the middle of April to the 30th of May. The Agricultural Department distributed on the Right Bank 3965 *maunds* (326,263 lbs) of pure seed to the cultivators.

On the Left Bank *Sind-Sudhar* having proved definitely during the past four years to be the best suited for Thar Parkar district and the lower portion of Hyderabad district, the comparative tests of 27 *W N* (*Desi*), 4-*F*-98, 285 *F*-2 and *Sind-Sudhar* were continued during the year under report in Nawabshah district and the upper part of Hyderabad district only. *Sind-Sudhar* gave the highest yield in Hyderabad district while it closely followed 27 *W N* as the second best in Nawabshah district. The chief difficulty in extending high quality cottons like *Sea Island* 2-4 and *Boss III*-16 is the absence of marketing organisation. These two varieties were grown during the year under review on an area of 1,400 acres and they gave an average yield of 7 *maunds* per acre.

The Department of Agriculture have developed a regular system of seed distribution suitable for the conditions of Sind and on the lines of this system they were able to distribute 7,400 *maunds* (608,900 lbs) of *Sind-Sudhar*, *Sind N R*, *Sea Island* and *Boss III*-16 seed. The total area sown to cotton in 1935-36 on the Left Bank was 790,858 acres against 669,100 acres in 1934-35.

CENTRAL PROVINCES AND BERAR

79 *The Verum Seed Distribution and Marketing Scheme*—In November 1929, the Committee sanctioned for a period of one year in the first instance a scheme for the seed distribution and extension of *Verum* 262 cotton and it commenced in September 1930. It was extended annually till the end of July 1934, when it was replaced by a combined scheme sanctioned for a period of 3 years for the extension and marketing of long staple cotton. During the year 1935-36 the Agricultural Department distributed 4,143½ *khandres* (3,248,504 lbs) of pure seed of long staple varieties sufficient to cover an area of 103,537 acres, whilst 5,594 *khandres* (4,385,696 lbs) of pure seed, obtained from the seed multiplication area of that year, were

stocked for distribution in 1936-37. The quantity of staple cotton disposed of in 1932-36 amounted to 6,523 bales which fetched an average premium of Rs 42.9 over *Broach* and Rs 60.4 over *Oomra* equivalent to a premium of 20.82 per cent on *Broach* and 32.26 per cent on *Oomra* which compares very favourably with the figures obtained in all the previous years since 1930-31 with the exception of 1931-35 when the corresponding premia were Rs 62.3 and Rs 82.

UNITED PROVINCES

80 *C 402 Seed Distribution Scheme*—This scheme was sanctioned in January 1934 for a period of five years for the distribution of *C 402* seed in the Haridol, Lucknow and Sitapur districts of the United Provinces and commenced work in May 1935. Though superior to the local cotton this variety requires more careful cultivation and it was therefore decided early in 1935 to restrict its distribution to Madhoganj and Bilgram *tehsils* only where it gives satisfactory results without extra labour and to extend in the remaining areas covered by the scheme another variety *C 520* which is better suited for them than *C 402*. The latter was grown during the year on an area of about 1,310 acres which gave an average yield of 4 to 6 maunds per acre. *C 520* was demonstrated on a total area of about 150 acres in 107 localities and the yield obtained varied from 7 to 10 maunds per acre.

HYDERABAD STATE

81 *The Hyderabad Seed Extension Scheme* was sanctioned in November 1929 and started work in March 1930. It was extended for three years in January 1933 and subsequently for a further period of 6 months up to the 31st August 1936. In August 1936 the Committee sanctioned a further extension for 4½ years subject to the condition that at least 50 per cent of the cost should be met by the State. During the first two years of the scheme *Dharwar No 1* and *Godag No 1* seeds were distributed but as a result of the experiments carried out by the Hyderabad Agricultural Department and in view of the fact that the Bombay Agricultural Department had found the *Jayaram* variety more suitable for the neighbouring areas of that province the distribution of *Dharwar No 1* seed was discontinued in 1931-32 in favour of *Jayaram*. During the year 1935-36 the Department of Agriculture maintained a seed multiplication area of 7,000 acres but due to the failure of cotton crop during the previous year in the area covered by the scheme and consequent dearth of pure seed, they were unable to distribute more seed than the quantity required for 41,250 acres. Arrangements have however been made to obtain from seed farm areas within the State itself enough pure seed for not less than 35,000 acres in 1937-38 season and purchase the remaining quantity from selected cultivators. The Department of Agriculture have also undertaken to organise the initial stages of seed production in more than one area to minimise the danger of setback in adverse seasons and remain independent of the Bombay Presidency for the supply of pure seed.

BARODA STATE.

82 *The Baroda (Navsari Seed Storage) Scheme* — This scheme was sanctioned in February 1933 for a period of five years for the rapid spread of 1027 *A L F* in Baroda territory, and started operations in April 1934. Unfortunately the very first year of this scheme was marked by the occurrence of a serious frost which gave a definite set-back to the spread of 1027 *A L F*. Owing to the damage to the cotton crop by frost, scarcity of pure seed was apprehended, but the timely step taken by the State Agricultural Department enabled them to secure from different sources 1,350,660 lbs of 1027 *A L F* seed. Of this quantity 147,555 lbs were issued for sowing 4,954 acres of the reserved area and the next year 873,239 lbs were distributed to cultivators. In 1935-36 the reserved area was carefully rogued, the produce obtained from it was ginned under the supervision of the Officer-in-Charge of cotton work and the seed was stocked for distribution in the 1936-37 season. Due to the distribution of pure seed on a large scale there were clear indications that the area under *Goghari* had declined. Throughout the season steady propaganda was continued in favour of 1027 *A L F* and against *Goghari* by the holding of meetings, the distribution of leaflets, etc. The Agricultural Department is making serious efforts to make Baroda independent of the Surat Farm so far as seed supply to cultivators is concerned. It is anticipated that in about two years' time the machinery for ensuring a steady supply of selfed seed of 1027 *A L F* and its multiplication on a large scale will be in full and effective working order.

RESEARCH STUDENTS

83 The training of research workers in the various branches of the science relating to cotton has claimed the attention of the Committee ever since its establishment. Distinguished graduates are selected and trained in methods of cotton research in recognised institutions in India and abroad or under experienced research workers either on the Committee's schemes, at the Institute of Plant Industry, Indore, at the Committee's Technological Laboratory or under agricultural officers in India. Scholarships are usually awarded for periods not exceeding two years but in deserving cases extensions are granted.

Two categories of scholarships are awarded, *viz*, training grants and general scholarships. Training grants are intended for Government servants who are recommended by provincial Governments and for Committee servants who are considered suitable. General scholarships are awarded to University Graduates selected by the Research Students Selection Sub-Committee. Applications for these scholarships are invited by advertisement in all leading Indian newspapers.

Fifty-four scholarships and eight training grants have so far been awarded by the Committee, out of these one scholarship and five training

grants were for foreign study. During the year under report two scholar ships and two training grants were sanctioned six research students were under training—four in India and two abroad.

At its meeting in August 1936 the Committee decided that in future the Director of the Institute of Plant Industry Indore might appoint students for training in cotton genetics at the Institute. The scholarships of these students will be paid by the Committee but the appointments would be subject to confirmation by the Research Students Selection Sub-Committee.

The expenditure on Research Studentships up to 31st August 1936 amounted to Rs. 2,52,351

P H RAMA REDDI
Secretary

CHAPTER VI.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, FOR THE YEAR ENDING 31st AUGUST 1936.

IN the present report an account will be given of the work done at the Technological Laboratory between 1st September 1935 and 31st August 1936. It will be seen from a perusal of this report that during the year under review the Laboratory not only maintained at the previous high level its service to the agricultural officers in assessing for them spinning values of their prominent strains, but that its resources were utilised to a much greater extent than in the past by the mills who sent their samples for tests and their problems for solution to the Laboratory. The work done at the Laboratory will as usual be described under the following five heads —

- I Spinning Laboratory
- II Research Laboratory.
- III Moisture Testing Section
- IV Publications
- V General

I SPINNING LABORATORY.

The following statement gives a summary of the agricultural samples of different cottons spun and tested at the Laboratory during the period under review together with the names of the suppliers of the samples —

BOMBAY

- (1) *The Cotton Breeder, S M C., Dharwar* —4 samples of Jayawant $\times 15$ crosses, 2 samples of Dh 1 \times Dh 2 crosses and one sample each of Gadag 1 and G1 \times 102 E 4
- (2) *The Cotton Breeder, Jalgaon* —9 samples of Banillas, 7 samples of Local cottons, 3 samples each of N V 57-7 and N V 56-3, 2 samples of N R 6 and one sample of N V 56-17
- (3) *The Agricultural Overseer, Padegaon* —6 samples for irrigation experiments
- (4) *The Cotton Breeder, S G, Surat* —4 samples of selections, 2 samples of Segregates and one sample of Surat B D 8
- (5) *The Cotton Breeder, Viramgam.* —2 samples of Segregates, one sample each of frost-affected Segregate 4-1 and Wagad 8 and a sample of Wagad Local

- (6) *The Cotton Breeder Broach*—3 samples of Selections 2 samples of B D 8 and one sample each of Goghari A 26 and Broach Local.
- (7) *The District Agricultural Officer Broach*—1 sample of B D 8 (Nabipur)

SIND

- (1) *Botanist in Sind A.R.S. Sakrand*—4 strains of 4F 18×3Moade, 2 samples of 4F 98 and one sample each of 289F 1 285F 2 Ashmouni Bora III Sea Island and W N 27
- (2) *The Cotton Physiologist Sakrand*—6 samples of 285F 2 for manurial experiments 3 samples each of 289F 1 and 4F 98 for irrigation experiments and 2 samples of Red Leaf 289F 1
- (3) *The Cotton Supervisor Indus Right Bank Dadu*—One sample each of 289F 1 and 4F 98

PUNJAB

- (1) *The Cotton Research Botanist Lyallpur*—10 samples of American Varietal Tests 16 samples of Desi Varietal Tests 7 samples of 39F for manurial experiments 18 samples of 4F for irrigation experiments 4 samples of D Q. cottons and one sample each of 4F 289F 43F and Mollisoni.
- (2) *The Deputy Director of Agriculture Hanoi (Punjab)*—One sample each of 1F 4F 43F and 289F

UNITED PROVINCES

- (1) *The Economic Botanist to Government, U P. Cawnpore*—5 samples of C 402 3 samples of C 520 and one sample each of Local White Flower and Yellow Flower strains

MADRAS

- (1) *The Cotton Specialist Coimbatore*—6 samples of Cambodia strains 4 samples of new strains, Co 2 sample from each of Adntural and Pollachi and one sample each of Karunganni 546 Uppam and Podupathy
- (2) *The Superintendent Agricultural Research Station Kollpatti*—10 samples of C 7 for different experiments 6 samples of Selections 5 samples of Kollpatti strains 2 samples of h.P.T.I and one sample of Perennial

- (3) *The Farm Manager, Agricultural Research Station, Nandyal*—2 samples of Gadag (Local and imported), 2 samples of Co. 2 (irrigated and dry) and one sample each of Hagari 1 and Selection 2390
- (4) *The Cotton Assistant, Perundurai*—1 sample each of Buorbon and Nadam
- (5) *The Agricultural Demonstrator, Dindigul*—1 sample of dry Cambodia (Kommariipatti)
- (6) *The Agricultural Demonstrator, Tadpatri*—1 sample of Hagari 1
- (7) *The Agricultural Demonstrator, Adoni*—1 sample of Hagari 1.
- (8) *The Agricultural Demonstrator, Guntakal*—1 sample of Hagari 1

CENTRAL PROVINCES —

- (1) *The Economic Botanist for Cotton, C P, Nagpur*—5 samples of different strains and 4 samples of Bani and Verum strains.
- (2) *The Superintendent, Government Experimental Farm, Akola*—1 sample of Strain 773.

MISCELLANEOUS —

- (1) *The Director, Institute of Plant Industry, Indore*—13 samples of Malvi selections, 3 samples of Kharva and Musakhori cottons, and 7 samples of Dhar Malvi sub-strains
- (2) *The Cotton Research Botanist, Parbhani*—7 samples of Gaorani strains, 5 samples of Parbhani strains, 1 sample each of Parbhani American and Havri 3 and one sample each of Gaorani, Gaorani 4 and Gaorani 6 from each of Parbhani, Madhol, Umri, Nanded, Loha and Latur
- (3) *The Crop Botanist, Malwa Division, Ujjain*—4 samples of Malvi cottons, 3 samples of Verums and one sample each of Banilla, Bani 306, B XXI, K 22, G 15, G 16, G 51, Cambodia, C 520, Roseum and Local
- (4) *The Senior Assistant Botanist, Haringur*—2 samples each of M A I, M.A II, and Local Doldahatti and one sample each of Herbecum 100, Selection 60, Local Sannahatti and Co 2

- (5) *The Second Economic Botanist to Government, Bengal, Dacca*—1 sample of 250F cotton
- (6) *The Inspector of Agriculture, Kolhapur*—1 sample each of Jayawant and Kumpta.
- (7) *The Superintendent, Main Farm, Raichur*—1 sample each of Hagari Jayawant, Mungari and Local kumpta
- (8) *The Assistant Botanist Butkara Experimental Station Bombo Uganda*—1 sample each of S G 29 N 17 S P 20 and two samples each of B 37 and Local

The following tables give the distribution of samples, lots and counts spun and tested at the Laboratory in each season since 1924 —

TABLE I.—*Distribution of samples spun, 1924-36*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Bombay	18	26	22	22	25	66	30	66	143	111	97	26	750
Sind													23
Punjab	14	1			42	37	10	44	25	42	25	71	372
United Provinces	1		6	11	8	7	18	7	12	8	7	11	99
Madras	2	19	37	22	30	31	65	15	28	101	30	81	646
Central Provinces	2		3	2	2	8	3	8	8	8	8	10	83
Miscellaneous	8	11		6	8	27	28	32	73	87	85	100	471
TOTAL	44	87	81	64	117	186	212	171	318	366	251	350	2,199
Standard Cotton Tests	8	84	49	64	33	34	27	18	18	18	18	23	362
Trade tests and Special Tests						37	99	154	125	166	151	143	825
GRAND TOTAL	54	111	130	128	150	257	328	323	461	549	400	496	3,386

TABLE II.—*Distribution of lots spun, 1924-36*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Bombay	36	52	44	41	33	107	90	69	143	111	97	61	807
Sind													23
Punjab	26	4			83	41	10	44	25	42	25	71	369
United Provinces	14		12	23	18	14	18	7	12	8	7	11	130
Madras	4	39	100	44	36	85	39	18	29	101	30	81	628
Central Provinces	2		3	4	4	10	4	8	8	8	8	10	97
Miscellaneous	8	23		12	8	33	28	32	73	87	85	100	496
TOTAL	36	118	162	128	227	290	218	172	318	366	251	372	2,633
Standard Cotton Tests	84	178	142	178	63	64	84	36	39	32	36	46	902
Trade Tests and Special Tests						87	119	136	129	173	173	178	906
G & TOTAL	120	292	304	306	285	361	336	304	483	573	462	553	4,541

TABLE III.—*Distribution of Yarns spun, 1924-36.*

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Bombay	103	152	132	132	159	323	253	203	430	332	292	190	2,700
Sind	106	14			254	113	31	136	165	127	72	220	1,236
Punjab	27		36	66	54	42	40	22	32	18	21	35	393
United Provinces	12	108	278	138	180	255	199	53	85	303	90	151	1,852
Madras	8		18	12	12	30	12	9	15	27	29	30	202
Central Provinces	3	58		36	27	99	100	93	227	293	250	295	1,481
Miscellaneous													
TOTAL	359	332	464	384	686	861	635	516	954	1,100	764	1,005	7,950
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	180	204	162	3,183
Tests and Special Tests						80	343	502	256	499	810	609	3,009
GRAND TOTAL	354	846	867	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	14,233

It will be seen from these tables that as compared with last year the number of samples spun during the period under review shows an increase of 24 per cent while the lots spun increased by 20 per cent. The number of yarns spun also shows a small increase. Among the samples received of the agricultural departments those sent from the Bombay Presidency, from a substantial decrease; but this is due to the separation of Sind Province as will be seen from the fact that the total for Bombay and Sind, Provinces practically the same as in the last year. Both the Punjab and Madras, show a very substantial increase in the number of samples sent to the Laboratory for tests, while the United Provinces and Central Provinces sent very nearly the same number of samples as last year. It will be noticed that, in spite of the increase from these provinces, the technical work of the Laboratory was not only maintained at its previous level but even speeded up, as is shown by the fact that special tests were made on 143 samples this year as against 131 samples last year. The number of standard cottons also shows an increase over last year which is due to the necessity, for certain technical reasons, of repeating tests on five of these cottons. It may be mentioned here that the two new cottons from Sind have been given the easy and attractive names of Sind Sudhar and N. R. and it is hoped that these names will prove popular among the trade.

The statement and the tables given above do not include either the small size samples which were received for fibre tests alone or samples of yarns on which tests were made at the Laboratory. A summary of the former will be found on page 69 in this report, while the latter numbered 73 were tested for mills on payment of fees laid down by the Indian Central Cotton Committee. The small size samples relate to the strains which are as yet in the early stages of experimentation and of the sufficiently large size samples are not available for carrying out spinning tests. When the process of selection, with a view to narrowing down the number of these strains, has proceeded sufficiently far in the light of the results obtained at the Laboratory, the selected strains will be grown

in quantities sufficient for spinning tests which in due course will be made at the Laboratory. In the meantime the Cotton Breeder is guided in his selection work by the results of fibre tests which are made on his strains.

The results of the tests carried out at the Laboratory are embodied in spinning test, fibre test and yarn test reports. These reports are sent to the suppliers of the samples and in the case of the agricultural samples received for tests at the Laboratory copies of the reports are also forwarded to the supervising officers of the cotton breeders. The cottons supplied by the East India Cotton Association and the Bombay and Ahmedabad Millowners Associations which represent other the fair average samples of the season's crop or its early arrival in the market are treated in a somewhat different way. The reports of the tests on these samples are published in the form of technological circulars which are distributed freely among the trade and the industry and copies of these circulars are also sent abroad to the principal importing countries of Indian cotton. The following table gives a statement of the number of reports falling under each class which were issued during the period under review together with the corresponding figures for the previous years.

TABLE IV—*Test Reports issued 1924-36*

	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Total 1924-36
Spinning Test Reports	7	19	19	22	21	63	92	60	87	121	112	135	723
Fibre Test Reports	1	1	6	1	7	4	7	13	30	13	19	44	186
Yarn Test Reports					4	4	2	3	3	9	7	13	43
TOTAL REPORTS	8	20	24	23	22	71	101	76	120	143	138	192	952

It will be seen that there is a very substantial increase under all heads in the number of reports issued from the Laboratory during the year under review. The number of fibre test reports was nearly $2\frac{1}{2}$ times of that issued last year, the number of yarn test reports issued was nearly double of that issued last year, while the number of spinning test reports showed an increase of 20 per cent. When it is realized that last year as many as 112 spinning test reports were issued, an increase of 20 per cent. in this figure raises it to the record figure of 135. As a result of this all round increase the total number of reports issued during the period under review rose to 192 from 138 for the last year, which represents an increase of 40 per cent.

In spite of this substantial increase in the number of samples tested in and reports issued from the Laboratory, the staff of the Laboratory remained practically the same as during the last year. Only two Research Students were added as previous experience had shown that it was wise to have at least one Research Student in hand to meet the demands from outside on the resources of the Laboratory without seriously dislocating its work. The main burden of the increase in the work of the Laboratory fell on the

old staff who showed commendable zeal in coping with the work especially as during the year the hours of work were increased. The strength of the permanent staff of the Laboratory from year to year since 1924 is given below in the following table.—

TABLE V.

As at August 31 in	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Technical Staff	8	11	20	24	27	27	32	32	32	33	34	34	34
Research Students	1	3	6	4	3	2	1	1					2
Fumigation Chemists			2	4	2	2	2	2	2	2	2	2	2
TOTAL	9	14	28	32	32	31	35	35	34	35	36	36	38

It may be added that it was found necessary, when the rush of samples became great, to employ four temporary junior testers for a period of three months each to enable me to meet the growing demand upon the resources of the Laboratory.

CLASSIFICATION OF SAMPLES

The samples received for tests at the Technological Laboratory fall under the following four classes—

- (a) Agricultural samples.
- (b) Standard Indian cottons
- (c) Trade samples
- (d) Technological samples

We shall now briefly describe the work done under each head —

(a) *Agricultural Samples*—These samples are mainly supplied by agricultural officers engaged on cotton breeding work in the different provinces of India. They either represent new or improved varieties which are under trial or such samples as are being grown in connection with the various botanical and physiological investigations undertaken by the Agricultural Department. Tests on new varieties are usually made on small samples and are restricted to fibre tests for the first few years. Guided by the results of these tests, only the most promising strains are retained for further experimentation. These are grown in sufficiently large quantities to enable the cotton breeder to send 10 lb samples to the Laboratory for spinning tests. The spinning tests are usually made for a number of years in order to make due allowance for seasonal variation and finally the most promising variety from the point of view of better yield, fibre-properties, ginning percentage and higher spinning performance is selected for the purpose of multiplication and general cultivation. Among the other category fall those samples which are raised in connection with such investigations as the effect of different manurial treatments, the effect of

different dates of sowing etc., etc. They are also usually repeated for a number of years to take into account the seasonal variation and at the end of each investigation a final report comprising the results for all the years is also issued to the officer who supplied the samples. Among the agricultural samples subjected to fibre and spinning tests this year at the Laboratory mention may be made of the following

(1) *Uganda Cottons*—As stated in my previous reports, the Indian Central Cotton Committee has agreed to test, free of charge, eight samples of cottons supplied by the Agricultural Department Uganda. The report containing the results of these tests on the last year's samples was considered by the Technological Research Sub-Committee who recommended that the Department should be asked to include a sample of N 17 cotton which forms the control for Busoga and Lango districts of the eastern zone. This recommendation of the Technological Research Sub-Committee was conveyed to the Department concerned who accordingly sent a sample of N 17 cotton along with the other samples.

(2) *Effect of differential irrigation upon the fibre properties and spinning quality of cotton.*—This investigation has been in progress for some time past. The available results were considered by the Technological Research Sub-Committee who recommended that in view of their useful and interesting nature they should be sent up for publication in a suitable journal. In view of the fact that the effect of differential irrigation on the stand in the field the shedding of flowers and bolls, the yield per acre etc. is equally important it was thought highly desirable that the account of this investigation should be complete with the collaboration of the cotton breeders. Accordingly the cotton breeders concerned were requested to send in their contribution and the bulletin detailing the results of this investigation will be published after the contributions from the cotton breeders have been received. In the current year 33 samples grown with different amounts of irrigation were received from Lyallpur Pudegaon Sakrand and Coimbatore

(3) *Tests on long staple Sind cottons*—In view of the increasing importance of the long staple cottons which can be grown in the new area brought under cultivation in Sind preliminary tests on two promising varieties, namely Sind Sea Island and Boes III cottons were made last year and the results were placed before the Technological Research Sub-Committee for their decision as to any further action that may be regarded desirable. The Technological Research Sub-Committee suggested that in the ensuing year tests should be made not only on samples supplied by the Agricultural Department but also those used by the mills in order to assess the variation in quality that may occur between the grower and the consumer. In accordance with the recommendation of the Technological Research Sub-Committee tests were made during the period under review on five samples of long staple Sind cottons of which two were supplied by the Agricultural Department, Sind and three by mills and firms using

these cottons. In addition, tests were also made for the purpose of comparison, on three samples of Giza 7 and one sample of Maarad cotton. The detailed report containing the results of these tests was placed before the Technological Research Sub-Committee who recommended that these tests should be repeated for one more season in order to make due allowance for seasonal variation. Accordingly samples of these cottons, as in the past, are being requisitioned both from the Agricultural Departments and from the mills and will be tested in due course.

(4) *Hyderabad Gaorani 4 and Gaorani 6 cottons*—It has been stated above that in the initial stages of experimentation tests in this Laboratory are generally made on small size samples which are tested for their fibre properties. Subsequently when the field of selection is narrowed down sufficiently, spinning tests are made on moderately large size samples. A good illustration of this useful principle will be found in the case of these two cottons which were tested for the first time in 1930-31, when 35 samples were received for fibre tests. In the following season fibre tests were made only on 14 samples, which gave the best results in the previous year, while in 1932-33 the selection was narrowed down to 6 samples which were grown in sufficiently large quantities to enable the Laboratory to undertake spinning tests on them for the first time. In the following two seasons the number of samples subjected to spinning tests were reduced to three, out of which Gaorani 4 and Gaorani 6 were distributed for district trials at six different centres. In the year under review spinning tests were made on 12 samples of the two cottons grown at different places and a comprehensive report detailing the results of these tests showing differential response of each variety to locality of growth, etc., was sent to the Agricultural Department.

(5) *Hiriyur cottons grown on dry and wet lands*—Two samples of each of three Mysore cottons, namely M A I, M A II, and Local Doddahatty, were received for tests. Each pair of these samples was grown under similar conditions with the difference that while one sample was grown under rain-fed conditions the other was raised under irrigated conditions. Fibre and spinning tests were made on these six samples, and it was found that in all cases the sample grown under rain-fed conditions gave a much better performance than the parallel sample grown under irrigated conditions. The results of these tests, which are likely to be valuable to the cultivator, were communicated to the Department in a report with the recommendation that these tests may be repeated in the following season.

(6) *289F Cotton grown in Dacca*—Although Dacca was at one time famous for its muslin industry, not much cotton is now grown in its environments. During the period under review the Department of Agriculture, Bengal, sent a sample of 289F cotton which was grown in Dacca. The results of tests on this sample showed that it compared very favourably with the 289F cotton grown in the Punjab. This is a promising development and the progress of this cotton in the following seasons will be watched with interest.

(7) *Desi crosses from Lyallpur*—During the period under review four *desi* crosses from Lyallpur, D C 1 D C. 6 D C 7 and D C. 13 were tested for fibre properties and spinning performance and were found to be much superior to Mollisoni. The best results among them were given by D C. 13. In order to find out its performance under mill conditions, arrangements were made with a local mill for testing a bale of this cotton which was supplied by the Cotton Research Botanist, Lyallpur. The mill expressed their complete satisfaction with the performance of this cotton which has since been named Jubilee cotton and supplied a sample of cloth made from it which was sent to the Cotton Research Botanist, Lyallpur.

(8) *Podupatti cotton from Malabar*—This is the first time that a cotton has been received for tests from Malabar. It was found suitable for spinning upto 11s standard warp counts and its behaviour in the ensuing seasons will be watched with interest.

(b) *Standard Cottons*—These cottons mostly represent the improved varieties which now cover some 15 per cent of the total area under cultivation of cotton in India. During the period under review no change was made in the list of standard Indian cottons. As usual, 4 page circulars were issued on the following ten cottons which were received sufficiently early in the season —

- 1 Punjab-American 260F
- 2 Verum 262 (Nagpur)
- 3 Verum 262 (Akola)
- 4 V 434 (Akola)
- 5 Late Verum (Nagpur)
- 6 Umri Banl.
- 7 Punjab-American 4F
- 8 Cambodia Co 2
- 9 Sind Sudhar
- 10 Surat 1027 A.L.F

The bulletin containing the results of tests on all the standard Indian cottons for 1935-36 together with the results for the previous seasons was issued in July 1936.

(c) *Trade samples*—(1) In order to bring the work of the Laboratory into closer touch with the industry and the trade, it has been the practice for some time past to undertake spinning tests on samples of trade varieties of Indian cottons. These samples fall under two heads. Under the first head are included those samples which are supplied by the East India Cotton Association. These represent the fair average quality of different varieties of Indian cottons which form the bulk of the cotton crop and are selected by the Standards Committee of the East India Cotton Association who also kindly supply their valuation reports. Under the second head fall those samples which are supplied by the mill members of the Bombay

and Ahmedabad Millowners' Associations and which represent the early arrivals of the various Indian cottons into the local markets. These samples are supplied by the mills who also kindly supply valuation reports on their samples. Both types of samples are subjected to a thorough spinning test and the results of these tests are published in 2 or 3-page circulars which are distributed to the trade and industry. Copies of these circulars, containing full information regarding the waste losses, spinning behaviour and yarn characteristics of these cottons, are also sent abroad to countries which import Indian cottons in appreciable quantities. The following statement gives a description of the trade samples which were tested during the period under review —

Cottons supplied by the East India Cotton Association

1	Coompta (1934-35)	10	Dholleras
2	C P No 1	11	Broach
3	Berar	12	Jagadia
4	Khandesh	13	Surat
5	Muttia	14	Navsari
6	Latur	15	Kalagn
7	Nanded	16	Farm Westerns
8	Punjab-American	17	Bijapur
9	Kadi-Viramgam	18	Upland

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad

BOMBAY

1	Bengals	11	Surat
2	Khandesh	12	Navsari
3	Ujjain	13	Tiruppur Cambodia
4	Mandsaur (Ujjain)	14	Moglai
5	Broach	15	African Busoga
6	Hubli Kumpta	16	African Kampala
7	Hubli Upland	17	African Jinja
8	Bailhongal	18	Farm Westerns
9	Karunganni	19	Miraj
10.	Kurnool Cambodia	20	Westerns

AHMEDABAD

1	Jagadia	2	Kadi
---	---------	---	------

A list of the technological circulars issued on these samples will be found under the head "Publications". Last year it was thought desirable to compile the circulars in the form of a bulletin which should constitute a handy reference book for the users of Indian cottons and should be entitled "Technological Reports on Trade Varieties of Indian Cottons". During the period under review this bulletin was published for the first time and was much appreciated by the public interested in the Indian cottons.

(2) In addition to these tests the Laboratory continued as in the past, to receive samples from private mills which were tested on payment of certain fees laid down by the Indian Central Cotton Committee. The scale of fees is given below —

(1) Fibre or Yarn Test —	Rs.	a.
(a) Mean fibre-length	7	8
(b) Fibre-weight per inch	7	8
(c) Fibre-strength	10	0
(d) Lea test	7	8
(e) Ballistic test	7	8
(f) Single thread test	7	8
(g) Twist	7	8
(2) Fibre and Blow room Test —		
(a) Fibre tests as for (a)—(c) above		
(b) Blow room only	10	0
(c) Shirley Analyser tests	7	8
(3) Full Test —		
(a) Fibre tests as for (a)—(c) above		
(b) Spinning test only	35	0
(c) Spinning test on combed cotton	50	0
(4) Variety of cotton (broad classification)	25	0
(5) Identification of fibre (microscopic test)	15	0
(6) Percentage of size	7	8
(7) " grease	7	8
(8) " free acid	15	0
(9) Presence of mildew	7	8
(10) Causes of mildew growth	30	0
(11) Percentage of immature fibres —		
(a) In lint or laps	10	0
(b) In yarn or cloth	15	0
(12) Wax content —		
(a) 1 Sample	12	8
(b) 2 Samples	22	8
(c) 3 Samples	30	0
(d) Each additional sample	7	8
(13) Determination of mechanical injury to fibre	10	0
(14) Tests in addition to the ordinary 3 roller system (per system)	10	0

(15) Cloth Samples .—			Rs	a.
(a)	Actual counts	..	15	0
(b)	Actual twist	.	20	0
(c)	Single thread strength	.	20	0

(16) Moisture Tests :—

(a)	1 Sample	.	5	0
(b)	2 Samples	.	7	8
(c)	3 Samples	.	10	0
(d)	4 Samples	..	12	8

During the period under review the number of such samples showed a very considerable increase which is a remarkable proof of the growing appreciation of the work of the Laboratory and the utilisation of its resources by the industry. During this period the Laboratory carried out on behalf of various mills and firms spinning tests on 7 samples, fibre tests on 32 samples, yarn tests on 73 samples, moisture tests on 10 samples, shirley analyser tests on 4 samples and blowroom tests on 1 sample, the total number of samples tested for the industry being 127. When it is remembered that last year the number of such samples was 39, the fourfold increase in one year is a striking illustration of the manner in which the industry is consulting the Laboratory more and more every year in the solution for its problems.

(3) *Effect of different degrees of compression on the spinning quality of cotton*—Following the recommendation of the Technological Research Sub-Committee these tests were performed on four good quality Indian cottons namely, Punjab-American 289F, Surat 1027 A L F., Jayawant and Cambodia Co 2. The report containing the results of this investigation was placed before the Technological Research Sub-Committee at its last meeting and it was decided that it should be published in the form of a bulletin. This will be done.

(4) *Effect of artificial watering on the spinning quality of cotton*—This investigation has now been brought to a close. The two cottons selected for this purpose were Amraoti and Broach (Palej). The experimental results are now being analysed and a report will be issued in due course.

(5) *Deterioration of cotton stored in the open and in the shed at Karachi*—The results of this investigation were considered by the Technological Research Sub-Committee who recommended that these should be published in the form of a bulletin. This was done and a summary of the bulletin will be found under the head 'Publications'.

(d) *Technological samples*—These samples are tested and spun at the Laboratory in connection with the various technological investigations which are undertaken here. A brief account will now be given of the more important investigations and the progress made in respect of each.

(1) *Tests with different systems of high draft spinning*—The Laboratory had already published in the past two bulletins on the application of different systems of high draft spinning to Indian cottons. This work has now been extended by using more systems of high draft spinning. Mixings of cottons prepared from Superfine Oomra, Punjab-American 4F and Cambrida Co. 2 as well as the pure cottons themselves have been spun on 9 different systems. The results of these tests are now available and are being written up in the form of a technological bulletin which will be published shortly.

(2) *The effect of storage on seed cotton prior to spinning*—Last year a bulletin on this subject was published in the Journal of Textile Institute. The Technological Research Sub-Committee, while considering a summary of the results, recommended that these experiments should be extended to a Kathiawar cotton such as Wagad 8 and that the period of storage should also be extended to four months. Accordingly, in the period under review tests embracing these two recommendations of the Technological Research Sub-Committee were carried out and a report on the results obtained will be published in due course.

(3) *Lint spinning tests*—In order to study the effect of inserting different degrees of twists on the strength, evenness, appearance, etc. of yarn spun from Indian cottons an investigation was undertaken on these lines. For this purpose yarns were spun from Superfine Oomra and Punjab-American 4F with different twist multipliers ranging from $3\frac{1}{2}$ to 5. Furthermore, the African cottons A. H. Kampala, A. R. Busoga and A. H. Jinja received for tests at the Laboratory were also spun with different twist constants. Similarly, the long staple cottons Giza 7 and Sea Island which were used in connection with another investigation were also spun with various twist constants. This investigation is in progress. It is proposed to extend these tests to other cottons in order to make the results and conclusions as comprehensive as possible.

(4) *Effect of different roller settings and twists on the spinning quality of cotton*—The object of these tests was to find out the best scheme of roller setting and twists in the fly frames and roller settings in the ring frame which would give the optimum results for strength, evenness, appearance, etc., of yarn. For this purpose Surat 1027 A.L.F., Punjab-American 4F and Cawnpore K. 23 cottons were selected and processed with different twists and roller settings in the fly frames and spun with different roller settings in the ring frame. The results of this investigation were published during the period under review in a bulletin a summary of which will be found under the head Publications. In continuation of this work it is now proposed to take one cotton, namely Punjab-American 280F, and to spin it from medium, light and heavy card aliver with different schemes of drafts and speeds in the fly frames in order to ascertain the best distribution of drafts and speeds which should give the optimum results for a cotton of this type. This work is in progress.

(5) *Quality of lint in relation to ginning factors*—It is being realised that considerable damage is done to Indian cottons, especially the long staple ones, by defective or improper ginning and that a systematic study of the best ginning conditions for different types of cotton is highly desirable. In view of this, seed-cotton of nine standard cottons was ginned in a single roller gin with different settings of the moving knife and in a saw gin with different speeds. The lint, obtained under each specific ginning condition, was spun into suitable counts and the yarns were tested for strength, evenness, neppiness, etc. The results of this investigation were published during the year under review in the form of a bulletin, a summary of which will be found under the head 'Publications'. As a continuation of this investigation, *kapas* of two cottons, namely, Cambodia Co 2 and Karunganni C 7, has been obtained. Moreover, in view of the increasing importance of the long staple cottons it is also proposed to obtain *kapas* of Sind Sea Island. Further tests with these seed-cottons, employing a wider range of moving knife setting on a full size double roller gin will be made. It is also intended to study the effect of density of feed on the quality of lint. These tests will be made as soon as opportunity permits.

(6) *Tests on mixtures of Indian cottons and staple fibre*—During the last few years cotton mills in general have been using the newly developed staple fibre in their preparations. In order to find out the suitability of mixing different types of staple fibre with different varieties of Indian cottons tests were undertaken during the period under review on three types of staple fibre which were mixed in different proportions with Cambodia and Jayawant. The pure cottons, the staple fibres and the mixtures were spun into suitable counts and tested for their yarn characteristics. A report containing the results of these tests will be issued very shortly.

(7) *Effect of raising the middle roller on the spinning performance of a cotton*—It was decided by the Indian Central Cotton Committee that if the results of any tests carried out on behalf of a particular mill are found to be of general interest and if the mill agrees to the publication of such results for general information, the ordinary fees chargeable for the work done by the Laboratory should be waived and the results should be published. During the period under review 16 samples of yarn spun from Sindhi cotton were received from a local mill. These yarns were spun with two different middle roller elevations and with light and heavy middle and back rollers. As it was felt that the results of the tests carried on these yarns might interest the mill industry in general, the permission of the mill was obtained for the publication of these results. The mill in question very kindly agreed to it and a bulletin containing the results of the tests was published during the period under review. A summary of this bulletin will be found under the head 'Publications'.

(8) *Tests on mixings of Indian cottons*—This investigation forms a part of the programme approved by the Indian Central Cotton Committee. The object of these tests is to find out the relative importance of the various

size properties in determining the mixing quality of two cottons. For this purpose tests have hitherto been made on Surat 1027 A L.F. Superfine Oemra Punjab-American 2491 Camba Ha Co 2 Navroli (Haleji) Punjab-American 41 Jayawant Khamraon Khampla Punjab-Dowl Raman and Waged 8. Besides size tests the cottons are mixed according to a plan and the mixtures are spun into suitable counts. This investigation is in progress.

(9) *Effect of humidity on carding*—The spinning room of the Laboratory is maintained during the dry season at a relative humidity of 60%—65%. During the monsoon, however, the humidity sometimes rises to about 80% and there is no mean available of bringing it down. As it may happen that a sample may be tested under a high humidity in one year and under a different medium humidity in the next year, it was regarded desirable to make some tests under these two conditions of humidity in order to find a basis of comparison for the spinning behaviour in general and the card losses in particular. The tests which were carried out for our own guidance gave some interesting results which it is proposed to publish in the form of a leaflet for general information.

II RESEARCH LABORATORY

Fiber Testing Section—It has been stated above that in addition to the samples on which a spinning test is made, small size samples for fibre tests alone are also received at the Laboratory. These samples are tested in the Fiber Testing Section. One noteworthy feature of the year under review is the fact that the East India Cotton Association sent as many as 62 samples for determination of mean fibre length. This represents a very large increase in the number of samples tested by the Laboratory for the Association in any one year and though in this particular year it may have been due to exceptional circumstances, it does emphasise yet another direction in which the work of the Laboratory has found an immediate and useful application and recognition. The following statement gives the distribution of the small size samples on which fibre tests were carried out at the Laboratory during the period under review—

- 1 *The East India Cotton Association, Ltd Bombay*—62 samples
- 2 *The Cotton Research Botanist, Parbhani*—17 samples of Gaorani strains 4 samples each of Parbhani strains and Balchur Khampla and one sample of Khampla Local
- 3 *Senior Assistant Botanist, Haryana*—4 samples each of Nadam and Cernuum crosses Arboreum and Herbaceum crosses and Natural cross selections and one sample of CxN 80
- 4 *The Farm Manager Andyal*—8 samples of selections

- 5 *The Cotton Specialist, Coimbatore*—12 samples of irrigation experiments.
- 6 *The Cotton Breeder, S. Gujerat, Surat*—One sample of Segregate.
- 7 *The Director, Institute of Plant Industry, Indore*—2 samples of hybrids
- 8 *The Director of Agriculture, Baroda State, Baroda.*—2 samples of 1027 A L F cotton
- 9 *The Cotton Breeder, Broach*—6 samples of F3 back crosses, 4 samples of B D 8 and Goghari crosses and 1 sample of New Selection 49.
- 10 *Senior Cotton Asst, Guntur*—5 samples of strains
- 11 *D R Vakharia Esq, Broach*—1 sample of Dakor Farm cotton

It will be seen from the above statement that during the period under review fibre tests were made on 133 samples, the corresponding figure for last year being 59. Thus, in the current year the number of samples increased by nearly $2\frac{1}{2}$ times as compared with the last year.

As might be expected, the Fibre Testing Section was kept fully occupied in making the tests on the samples mentioned above as well as on those on which spinning tests were made.

Mr Hari Rao, in addition to supervising the work of this Section, very nearly completed the analysis and writing up of an account of his investigation relating to the effect of twist on the strength and extension of cotton fibre. This investigation has given some extremely interesting results. It has shown that whereas the strength of the individual cotton hair increases in the case of all cottons at first with the insertion of twist and then decreases, the rates of increase and decrease are different for the different cottons and the peak values of strength are attained at lower twists for the shorter than for the longer cottons. It is also found that the left-handed twist has a greater effect in modifying fibre-strength than the right-handed twist of an equal amount, that the contraction of fibres upon the insertion of twist increases rapidly with medium and high twists and is greater for the shorter than for the longer cottons but that the direction of twist does not make any difference to the percentage contraction. Detailed results of this investigation will, it is hoped, be soon published in the form of a Technological Bulletin.

Physics Section—*Mr R S Koshal* continued his analysis on the effect of distribution of rainfall and temperature on the fibre-properties and

spinning quality of cotton. During the period under review an analysis of the following cottons was completed —

<i>Madras</i>	Nandval
	Karunavandi C. 7
	Hagari I
<i>United Provinces</i>	C. A. 9
<i>Central Provinces</i>	Verum 262 (Nagpur)
	Verum 262 (Akola)
<i>Bombay</i>	Surat 1827 A.L.F.

The other cottons for which the data are available and are being analysed are Waghal 8, Jayawant and Gadag I. In view of the great importance of this subject to cotton growers and the very interesting results which have already been obtained it is proposed to place this subject on the agenda of the First Conference of Research Workers on Cotton which is expected to be held after the next cold weather meeting of the Committee.

Mr C. V. Sanjundayya was engaged for part of the period under review for writing up a description of the stapling apparatus which was designed at the Laboratory some time ago. A bulletin describing the construction and use of this apparatus and containing a summary of the results obtained with it has been sent for publication in the *Journal of the Textile Institute, Manchester*. During the remainder of the period Mr Sanjundayya continued his investigation on the relation ship between the fibre properties and the breaking strength and extension of yarn. This investigation forms a part of the programme of work approved by the Committee and is in progress.

Dr K. R. Sen continued with his investigation on the relative importance of the various fibre properties in determining the mixing quality of Indian cottons. This investigation also forms a part of the programme of work approved by the Indian Central Cotton Committee and a reference to it giving an account of the cottons selected for this purpose has already been made under the head Technological Samples.

Microscopy Section — Mr A. V. Gulati has continued with his investigation on the effect of hereditv, environment, irrigation, rainfall, etc. on the maturity of cotton fibre. It was found that very suitable material for this investigation was available from the various farms affiliated to the Institute of Plant Industry, Indore. The Director of the Institute very kindly agreed to supply small samples for the purpose of this investigation. The investigation, however, had to be temporarily suspended owing to the illness of Mr Gulati which necessitated his absence from the Laboratory for 2½ months.

It will be remembered that an investigation was completed at the Laboratory sometime ago on the relationship between the maturity of cotton fibre and the neppiness of yarn spun from it. In this investigation the method employed for the determination of maturity in cotton fibre, though accurate, was found to be rather slow and tedious. During the period under review an attempt was made to improve this method so that a larger number of tests could be carried out in a much shorter time. This attempt proved successful and a new type of slide, which could be easily fitted on the stage of standard microscope, was designed at the Laboratory. The use of this slide made the work of mounting and counting fibres much less irksome than in the past, and the maturity percentage determination could be made much more quickly without any loss in accuracy of results. A short note describing this new device was sent up for publication to the Journal of the Textile Institute and appeared in the April 1936 issue of the Journal. Several of these slides, manufactured at the Laboratory, have been supplied to the Technological Assistants working in the mofussil laboratories.

Mr Gulati also made observations on a new type of progressive damage to cotton fibre by micro-organisms. An account of it was published in the Indian Journal of Agricultural Science and a summary of it will be found under the head 'Publications'.

Chemistry Section—Mr D L Sen remained on study leave during the period under review. He is at present working under Prof Scholefield at the College of Technology, Manchester, and is due to return on the 20th September 1936.

Dr Laxmi Thoria continued his work on the determination of the cellulose content of different varieties of Indian cottons. The results obtained by him upto November 1935 were considered by the Technological Research Sub-Committee and it was decided that these tests should be made on such short staple cottons as are capable of giving, by virtue of possessing a high yield and high gunning percentage, a large outturn of cellulose per acre. The Directors of Agriculture of the various Provinces and Indian States were requested to ask their cotton breeders to send samples of such high yielding short staple varieties. In response to this request 40 samples were received out of which tests were made on nearly 30 samples. In addition to the testing of these samples, Dr Thoria has also made tests with a view to finding out if certain modifications in the treatment given to cotton would result either in a substantial improvement in the quality of the films made from it or an appreciable reduction in the cost of the treatment. During the period under review Dr Thoria brought the first investigation to a close and also did a certain amount of preliminary work with regard to the second investigation. An account of these two investigations will be published in due course.

Mr G Rama Rao was appointed Research Scholar on the 20th January 1936 and after the customary training in the determination of physical and

chemical properties of cotton fibre was put on an investigation on the absorption of dyes by Indian cottons at the point where it was left by Mr D L Sen. Mr Sen in his work had used a method of adding the dye solution to the cotton until the saturation point was reached. Since this method was not only slow but was also subject to personal errors of judgment, a new colorimeter which employs the photo-electric cell, has been designed at the Laboratory in which the amount of dye left over in the solution is accurately measured. During the greater part of the period covered by this report Mr Rama Rao was engaged in erecting and calibrating this new apparatus. The remainder of the period was utilised by him to the examination of the absorption of certain well known dyes by some of the standard cottons.

Mr Rama Rao also assisted me in completing an apparatus for recording the direction of wind. A request for an apparatus of this type was made by the Cotton Research Botanist, Lyallpur some time ago, who stated that he required it in his work on the study of the effect of wind on cotton crop. This apparatus was designed and completed during the period under review and supplied to the Cotton Research Botanist, Lyallpur.

Mr M U Parmar who was the second Research Scholar selected in the course of this year joined the Laboratory on the 16th January 1936. He was also given the customary training in the methods of fibre and yarn tests. After he received this training he was entrusted with the investigation on the effect of kier boil treatment on the yarn properties and fibre structure of cotton. The cottons selected for this purpose are Punjab-American 283F, Surat 1027 A L F and Jayawant. Samples of yarn spun from each of these cottons were given different kier boil treatment in the Department of Chemical Technology, University of Bombay. These samples are being tested for strength, extension and chemical damage at the Laboratory while according to the present arrangement the lustre test will be made by the Department of Chemical Technology.

Mr Parmar also made a number of tests in connection with the investigation on the effect of raising the middle roller setting to which a reference has been made under the head 'Technological Samples'.

III MOISTURE TESTING SECTION

In the absence of Mr D L Sen on study leave Mr P S Sambamurthy, carried out the work of this Section. During the period under review 24 samples were tested for moisture as follows —

Appeal Committee	2
Trade	11
Laboratory	11

The total number of samples tested at this Section upto 31st August 1936 is 771.

IV PUBLICATIONS

The Brochure entitled "Cotton Research in India" was published in accordance with the recommendation of the Technological Research Sub-Committee during the period under review. I am glad to be in a position to say that this Brochure was very well received by the Presses, the research organisations and the trade and industry connected with cotton. I give below a few of the extracts from the reviews and letters relating to this Brochure.

Textile Manufacturer—"The Indian Central Cotton Committee though it has—together with the Indian Agricultural Department—great things to its credit, has too many huge problems in front of it to feel much satisfaction, but it can look to its Technological Laboratory at Matunga with pride. . . . It was a pioneer Institute for in the actual establishment of a Cotton Spinning Laboratory it was in advance of the Shirley Institute or the Egyptian Government. . . . Collected together, it marks an impressive work of reference. The spinning tests in its next section look both ways, they are tests of cotton on behalf of the breeders and the growers and technological research which serves the users and thus encourage the proper use of and appreciation of the improved Indian cottons. . . . There is incidental research work which is of great interest and value directly to the cotton spinner."

International Cotton Bulletin—"Dr Nazir Ahmad and the Indian Central Cotton Committee are to be congratulated upon the production of a work of exceptional interest."

A Mill—"On going through, we find the book very useful and we appreciate the work of the Laboratory."

Consul General for Belgium—"I have sent the same to the Belgian Ministry for Colonies, who, I feel assured, will find this documentation interesting and helpful for their research work in Africa."

Royal Afghan Consulate—"I congratulate you on this valuable publication and the success that your Laboratory has attained and the services that it is rendering under your leadership to the most important industry in India."

Prof F. Scholfield—"Thank you very much for the copy you have sent me of your very interesting report on cotton research in India."

W T Astbury, Esq — This is to acknowledge with very many thanks the arrival of the copy of your pamphlet on cotton research in India which you so kindly sent me. You may be sure that I am very pleased indeed to have this.

Commissioner, Ministry of Industries National Government of the Republic of China — I found that this Brochure is of much interest to this Bureau and have put it in our library for the public to read.

Russell T Fisher Esq The National Association of Cotton Manufacturers U.S.A — I know it will be a valuable addition to the Association Library.

H A Hancock Esq Cotton Research Board Giza Cairo — I received your booklet Cotton Research in India which I have read with very great pleasure. It has not been acknowledged before because I was under the impression that I was reading the Library copy! The volume and the quality of work reflect the great credit on your Laboratory and your Committee a policy of free and open publication make the results of treble value.

In addition to this Brochure the following publications were issued during the period under review —

I TECHNOLOGICAL BULLETINS Series A Nos 28 to 34

1 Technological Bulletin Series A, No 28

Technological Reports on Standard Indian Cottons, 1935 by Nazir Ahmad, M.Sc. Ph.D, F Inst. P

2 Technological Bulletin Series A No 29

"Technological Reports on Trade Varieties of Indian Cottons 1935 by Nazir Ahmad, M.Sc., Ph.D, F Inst. P

3 Technological Bulletin Series A No 30

The Effects of Storing Cotton Bales in the open and inside a shed at Karachi by Nazir Ahmad, M.Sc., Ph.D F Inst P

4 Technological Bulletin Series A No 31

Quality of Lint in Relation to Ginning Factors by Nazir Ahmad M.Sc Ph.D, F Inst. P

5 Technological Bulletin Series A No 32.

The Effect of Employing Different Roller Settings and Twists on the Spinning Performance of three Indian Cottons by Nazir Ahmad, M.Sc. Ph.D F Inst. P and R. P Richardson F.T.I.

- 6 Technological Bulletin Series A, No 33
"Technological Reports on Standard Indian Cottons, 1936 "
by Nazir Ahmad, M Sc , Ph D , F Inst P
- 7 Technological Bulletin Series A, No 34
"The Effect of Raising the Middle Roller and some other
factors on the Yarn Strength of Sindhi Cotton " by Nazir
Ahmad M Sc , Ph D , F Inst P

II TECHNOLOGICAL BULLETIN, Series B No 21

- 1 Technological Bulletin, Series B, No 21
"A new Method and Apparatus for Determining the Average
Length and Fineness of Cotton Hairs " by Nazir Ahmad,
M Sc , Ph D , F Inst P and C Nanjundayya, M Sc

III MISCELLANEOUS PUBLICATIONS

- 1 "A Device for Mounting Cotton Hairs for Examination of
Fibre-Maturity " by N Ahmad, M Sc , Ph D , F Inst P
and A N Gulati, M Sc
- 2 "A Note on a New Type of Progressive Damage to the
Structure of Cotton Hair caused by Micro-organisms "
by A N Gulati, M Sc

IV TECHNOLOGICAL LEAFLETS

- 1 Technological Leaflet No 5, entitled
"The Influence of Method of Picking on the Quality of
Cambodia Cotton "

V TECHNOLOGICAL CIRCULARS Nos 196 to 257, as under —

Circular No	Title	Date of publication
196	Spinning Test Report (No 624) on samples of Dholleras cotton, 1934-35	September 1935
197	Spinning Test Report (No 626) on samples of Westerns cotton, 1934-35	September 1935
198	Spinning Test Report (No 627) on samples of Surat Cotton, 1934-35	September 1935
199	Spinning Test Report (No 628) on samples of Tinnevely Cotton, 1934-35	September 1935
200	Spinning Test Report (No 630) on samples of Cambodia Cotton, 1934-35	September 1935
201	Spinning Test Report (No 631) on samples of Karun- gannu Cotton, 1934-35	September 1935
202	Spinning Test Report (No 633) on samples of Bijapur Cotton, 1934-35	September 1935

Circular No.	Title.	Date of publication.
203	Spinning Test Report (No. 614) on samples of Nagarkote Cotton, 1934-35	September 1935.
204	Spinning Test Report (No. 615) on samples of A. R. Jinja Cotton, 1934-35	September 1935.
205	Spinning Test Report (No. 617) on samples of A. R. Nagara Cotton, 1934-35	September 1935.
206	Spinning Test Report (No. 618) on samples of A. R. Kampala, 1934-35	September 1935.
207	Spinning Test Report (No. 644) on samples of hempia Cotton, 1934-35	September 1935
208	Technological Report on Punjab American 2421 1935-36	December 1935.
209	Spinning Test Report (No. 631) on samples of Ujj in Cotton, 1935-36	January 1936.
210	Spinning Test Report (No. 664) on samples of Bengala Cotton, 1935-36	January 1936.
211	Spinning Test Report (No. 667) on samples of Khandarah Cotton, 1935-36	January 1936.
212	Spinning Test Report (No. 670) on samples of Moglal Cotton, 1935-36	January 1936.
213	Spinning Test Report (No. 640) on samples of Ujjain (Mandana) Cotton, 1935-36	February 1936
214	Technological Report on Verum 62 (Nagpur), 1935-36	February 1936.
215	Technological Report on Verum 263 (Akola), 1935-36	February 1936
216	Technological Report on Verum 434 (Akola), 1935-36	February 1936.
217	Technological Report on Late Verum (Nagpur) 1935-36	February 1936.
218	Technological Report on Early Verum, 1935-36	February 1936.
219	Technological Report on Punjab American 41 1935-36	February 1936.
220	Spinning Test Report (No. 623) on samples of Nanded Cotton, 1935-36	March 1936
221	Spinning Test Report (No. 625) on samples of C. P. No. 1 Cotton, 1935-36	March 1936.
222	Spinning Test Report (No. 626) on samples of Later Cotton, 1935-36	March 1936.
223	Spinning Test Report (No. 697) on samples of Punjab American Cotton, 1935-36	March 1936.
224	Spinning Test Report (No. 700) on samples of Mottla Cotton, 1935-36	March 1936.
225	Technological Report on Cambodia Co. 2 (Cambodia 440), 1935-36	April 1936.
226	Spinning Test Report (No. 703) on samples of Narwar Cotton, 1935-36	April 1936.
227	Spinning Test Report (No. 704) on samples of Bural Cotton, 1935-36	April 1936
228	Spinning Test Report (No. 705) on samples of Ballhongal Cotton, 1935-36	April 1936
229	Spinning Test Report (No. 706) on samples of Tirupur Cambodia Cotton, 1935-36	April 1936.
230	Spinning Test Report (No. 707) on samples of Broach Cotton, 1935-36	April 1936.
231	Technological Report on Hind Sudhar (280F 1), 1935-36	April 1936
232	Spinning Test Report (No. 708) on samples of Farm Westerns Cotton, 1935-36	April 1936
233	Spinning Test Report (No. 709) on samples of Westerns Cotton, 1935-36	April 1936
234	Spinning Test Report (No. 710) on samples of Hubli Kumbha Cotton, 1935-36	May 1936.

Circular No	Title	Date of publication
235	Spinning Test Report (No 711) on samples of Hubli Upland Cotton, 1935-36	May 1936
236	Spinning Test Report (No 712) on samples of Navsari Cotton, 1935-36	May 1936.
237	Spinning Test Report (No 713) on samples of Surat Cotton, 1935-36	May 1936
238	Spinning Test Report (No 714) on samples of Jagadia Cotton, 1935-36	May 1936
239	Spinning Test Report (No 715) on samples of Kadi Cotton, 1935-36	May 1936
240	Technological Report on Surat 1027 A L F, 1935-36	May 1936
241	Spinning Test Report (No 719) on samples of Dhollerias Cotton, 1935-36	June 1936
242	Spinning Test Report (No 728) on samples of Broach Cotton, 1935-36	July 1936
243	Spinning Test Report (No 729) on samples of Jagadia Cotton, 1935-36	July 1936
244	Spinning Test Report (No 730) on samples of Berar Cotton, 1935-36	July 1936
245	Spinning Test Report (No 733) on samples of African Busoga Cotton, 1935-36	July 1936
246	Spinning Test Report (No 734) on samples of Jinja Cotton, 1935-36	July 1936
247	Spinning Test Report (No 735) on samples of Khandesh Cotton, 1935-36	July 1936
248	Spinning Test Report (No 736) on samples of Kampala Cotton, 1935-36	July 1936
249	Spinning Test Report (No 739) on samples of Miraj Cotton, 1935-36	July 1936
250	Spinning Test Report (No 740) on samples of Tiruppur Cambodia Cotton, 1935-36	July 1936
251	Spinning Test Report (No 742) on samples of Karunganni Cotton, 1935-36	July 1936
252	Spinning Test Report (No 743) on samples of Northern Cambodia Cotton, 1935-36	July 1936
253	Spinning Test Report (No 754) on samples of Farm Westerns Cotton, 1935-36	August 1936
254	Spinning Test Report (No 755) on samples of Upland Cotton, 1935-36	August 1936
255	Spinning Test Report (No 756) on samples of Kadi Virangam Cotton, 1935-36	August 1936
256	Spinning Test Report (No 757) on samples of Bijapur Cotton, 1935-36	August 1936
257	Spinning Test Report (No 758) on samples of Kalagin Cotton, 1935-36	August 1936

Summaries of the Publications issued during the period under review are given below —

(1) *Technological Bulletin Series A, No 30 "The Effects of Storing Cotton Bales in the Open and Inside a Shed at Karachi"*—This report contains an account of the investigation carried out to find (1) the extent of the deterioration occurring in the bales kept in the thole-yard in Karachi

taking for purposes of comparison similar bales stored for the same period of time in a shed and (ii) whether the expenditure for erecting godowns in Karachi would be justified by the better results and prices obtained for the bales stored in these godowns. This investigation was extended to the three varieties (1) Punjab-American (2) Punjab-Deshi and (3) Sind Deshi which form the bulk of the trade cotton received at Karachi. Six bales of each variety were obtained out of which three were placed in the tholo-yard and the other three inside a shed. At the commencement of the experiment the top hoop of each bale was broken and a representative sample weighing 2½ lbs. was drawn from several layers. This was tested in duplicate lots and formed the basis of comparison for the samples drawn on subsequent occasions. The bales were then repressed by hand and stored for six months after which representative samples were drawn from one bale of each variety to the shed and the tholo-yard. This process was repeated after 12 months and 18 months storage the samples being tested similarly on each occasion. Out of these the initial tests and those obtained after 12 months storage referred to early part of the year before the rainy season while the other two sets referred to the latter part of the year soon after the rainy season. The following conclusions were drawn from the results of these tests —

1. *Fibre Properties* —The fibre-results showed that storage of these cottons for periods extending upto 18 months had no appreciable effect either upon their mean fibre-length or mean fibre-weight per inch. There was, moreover, no indication of any differential response either in respect of the manner of storage (tholo-yard or godown) or in regard to the variety of cotton.

2. *Yarn Strength* —As against the fibre-tests the yarn results showed a significant change in the spinning quality of these cottons depending upon the manner of storage. Furthermore the three types of cotton responded differently to the action of time and the condition of storage.

(i) It was found that if bales of these cottons are stored for some time either in the tholo-yard or in the shed, stronger yarns are obtained which is due to the atmospheric conditions of humidity and temperature. It should however be emphasised that this improvement takes place only in yarn-strength and is off-set to a certain extent by the gradual discoloration and loss of bloom of the stored cotton.

(ii) Keeping the bales in the open in the tholo-yard has a very definite harmful effect upon the spinning quality of these cottons this effect being most pronounced with Punjab-Deshi less so with Sind Deshi and least of all with Punjab American. It should also be stressed that these results do not take into account the loss in colour bloom etc. which is over and above that sustained by the cotton in its spinning performance.

3. *Grader's Valuation.*—Both bodies of experts, the Appeal Committee of the East India Cotton Association and the Board of the Karachi Cotton Association, agree that for each type of cotton the bales stacked in the thole-yard would fetch a lower price than those stored inside a shed, thereby resulting in financial loss to the merchant, which may amount to several lakhs of rupees

(2) *Technological Bulletin, Series A, No. 31*—"Quality of Lint in Relation to Ginning Factors"—The Bulletin describes the results of ginning tests on 9 Indian cottons, ranging in staple length from 0 70" to 0 94" and in mean fibre-weight per inch from $0\ 109 \times 10^6$ oz to $0\ 269 \times 10^6$ oz. Each cotton was divided into four lots, two lots were passed through a saw-gin with saw speeds of 325 r p m and 425 r p m, the other two lots were passed through a roller-gin, the overlaps for the shorter cottons being $\frac{3}{8}$ " and $\frac{4}{8}$ " and those for the comparatively longer cottons $\frac{4}{8}$ " and $\frac{5}{8}$ ". Each lot was tested for mean fibre-length and spun into two or three suitable counts, the yarns obtained being examined for breaking strength and neppiness. The mean fibre-weight per inch of each sample was determined and fibre-strength tests were made on the different lots of four cottons. From the experimental results the following conclusions are drawn —

1 The comparatively longer cottons gave a much higher out-turn with the larger than with the smaller overlap. The difference between the out-turns with the two overlaps diminished with the staple length of the cotton, and with the shortest cotton a higher out-turn was obtained with the smaller overlap.

The higher saw speed gave a significantly higher out-turn in the case of all cottons except one. The difference between the out-turns with the two speeds was independent of the staple length of the cotton, but the various cottons showed a differential response in this respect.

2 For a majority of these cottons the greater overlap gave higher ginning percentage. However for cottons possessing a mean fibre weight of nearly $0\ 150 \times 10^6$ oz per inch, the reverse was found to be the case. The use of either of the two saw speeds did not make any appreciable difference to the ginning percentage in most cases.

3 For the short and medium staple Indian Cottons, an overlap of $\frac{3}{8}$ " was found to be quite sufficient, while for the comparatively longer types, better fibre results were obtained with an overlap of $\frac{4}{8}$ ". The lower speed was found to be more beneficial from the point of view of staple length of the ginned cotton, especially in the case of the comparatively longer types.

4 The values of the fibre-strength of these cottons were unaffected either by the overlaps or the speeds employed in these tests.

5 The smaller of the two overlaps in the roller gin and the lower speed in the saw gin effected, on the whole a greater degree of cleanliness thereby giving rise to somewhat smaller waste losses in the blow room.

6 The differences between the card losses of the various lots of each cotton were insignificant.

7 The number of yarn breakages in the ring frame were, on the whole found to be fewer, with the smaller than with the greater overlap and with the higher than with the lower speed.

8 On the whole, the lots ginned with the smaller overlap in the roller gin and the lower speed in the saw gin gave stronger yarns than the corresponding lots ginned with the greater overlap and the higher speed. This general statement however, should be supplemented in each case by studying the individual response of the cottons to overlaps and speeds for which detailed results are given in the bulletin.

9 The width of the overlap in the roller gin and the speed of saws in the saw gin within the range employed in these tests did not make any appreciable difference to the degree of yarn neppiness in the case of a majority of these cottons.

(3) *Technological Bulletin Series A No 32 — The Effect of Employing Different Roller Settings and Twists on the Spinning Performance of three Indian Cottons* — The object of the tests described in this bulletin was to study the effect on the spinning performance of Indian cottons of using different twists in the fly frames and roller settings in the ring frame. For this purpose three Indian cottons, namely, K. 22 P.A. 4F and Surat 1027 A.L.F. were selected the first being short and coarse the second short but relatively fine and the third possessing a staple of medium length. The settings and twists normally employed at the Laboratory were taken as standard and these were varied on either side within the practical range.

The mean fibre-length and the fibre-weight per inch of each of the three cottons were determined. Each cotton was processed with the different settings and twists and spun into suitable counts. The yarns obtained were examined forlea breaking strength, single thread strength evenness, number of neps per yard etc. The number of yarn breakages sustained by each doffing during the spinning process was recorded.

From the experimental data the following conclusions are drawn —

1 The two short staple cottons registered fewer yarn breakages in the ring frame with $1\frac{1}{2}$ than with $\frac{1}{2}$ front roller setting. Among these the finer cotton responded better to the change in settings than the coarser one.

2 The effect on the number of yarn breakages of changes in the settings of the other frames was either small or anomalous. It was clear that these effects were being masked by other factors, pointing to the desirability of further work.

3 Compared to the normal setting of the Laboratory, a closer front roller setting ($1/16''$ gauge) in the ring frame was decidedly beneficial to the strength of the resultant yarns with the two short stapled cottons, but was of doubtful value with the medium stapled cotton.

4 By using closer front roller settings both in the ring and the roving frame with reduced twist in the latter machine, the increase in yarn strength was more pronounced especially in the case of the two short staple cottons.

5 As against this, closer settings and reduced twist in the three fly frames effected no change in the yarn strength of K 22, a very small improvement in that of P A 4F, and a reduction in that of Surat 1027 A L F.

6 Thus, on the whole, closer front roller settings in the rover and the ring frame are definitely advantageous with a short and coarse cotton like K 22, somewhat less so with a short but fine cotton like P A 4F, and of doubtful advantage with medium staple cotton like Surat 1027 A L F.

7 In order of merit the effect is greatest when a change in the front roller setting is made both in the ring frame and the rover, less so when it is made in the ring frame only and least of all when it is effected in the three fly frames.

8 The effect of opening the front rollers on yarn strength is in the opposite direction to that of closer settings. With this change, the yarns, on the whole, are found to be weaker than with the normal settings of the Laboratory. As would be expected, the loss in strength is greatest when the wider settings are employed both in the rover and the ring frame, somewhat less so when the change is confined to the ring frame, and least of all when these alterations in settings are made in the fly frames.

(4) *Technological Bulletin, Series A, No 34* —“ *The Effect of Raising the Middle Roller and some other Factors on the Yarn Strength of Sindhi Cotton* ” Sixteen samples of yarns spun in a local mill were tested for strength with the object of ascertaining the influence of the following three factors (i) the height of the bottom middle roller with respect to the other two rollers, (ii) the weight of the top middle roller, and (iii) the weight of the top back roller. For (i), the bottom middle roller was raised by means of specially constrained roller stands so that its top surface stood respectively $1/32''$ and $2/32''$ above the tangent to the first and third rollers. For (ii), the weights of the top middle roller employed in these tests were 5 oz., 4 oz.,

3 oz., and 2 oz. For (iii) the weights of the top back rollers used were $2\frac{1}{2}$ lbs and $3\frac{1}{2}$ lbs, respectively. The following conclusions are drawn from the results —

I. The effect of raising the middle roller from $1/32$ to $2/32$

(i) Thelea breaking strength of the yarns spun with $2/32$ middle roller elevation lies between 75 to 80 lbs., while that of the yarns for which the rollers were lifted by only $1/32$ is only about 65 lbs. Thus by a small change in elevation of the middle roller an improvement of 10 to 15 lbs in test was obtained. This improvement is attributed to the better control exerted over the fibres when they are made to adopt a curved instead of a straight path in their passage through the rollers

(ii) The best strength results were obtained when the ordinary top back roller was used in combination with $2/32$ middle roller elevation while the heavy back roller in combination with $1/32$ middle roller elevation gave the poorest results

(iii) The average difference in yarn strength on elevating the middle roller from $1/32$ to $2/32$ became progressively less as the weight of the middle roller was reduced shewing that the combination of the lighter top middle rollers with $2/32$ elevation gave, on the whole stronger yarns

Both the interactions (ii) and (iii) show that a rigid control of the fibres as represented by a heavy back or middle roller is likely to give weaker yarns than relatively elastic control exerted by a comparatively lighter back or top middle roller

II. The effect of using middle top rollers of different weights varying from 5 oz. to 2 oz. With $2/32$ middle roller elevation the use of the comparatively light top middle roller in place of the 5 oz. one affected the yarn strength one way or another depending upon the weight of the top back roller. But with $1/32$ middle roller elevation the use of the lighter middle rollers gave an increase in the yarn strength regardless of the weight of the top back roller

III. The effects of using ordinary or the heavy back roller—

(i) The effect of replacing the ordinary with the heavy back roller is on the whole a reduction in yarn-strength the decrease being greater with the smaller than with the larger middle roller elevation. It appears as if the better control of the fibres resulting from lifting up of the bottom middle roller can neutralise to some extent the adverse effect of using a heavy back roller

(ii) The adverse effect of using the heavy back roller becomes progressively less as the weight of the top middle roller is reduced, the only exception to the rule being the lightest of the four rollers weighing only 2 oz. for which there is a reversal of the effect.

(5) *Technological Bulletin Series B, No 21 "A New Method and Apparatus for Determining the Average Length and Fineness of Cotton Hairs"*—A review of the previous work done on the relationship between the fibre-properties and the spinning value of a cotton indicates that the two properties which contribute mostly to the spinning quality are the mean length and the weight per unit length. Consequently, rapid and accurate methods of determining these two properties should be of immense value not only to the cotton breeder, but also to the trade and Industry. Several methods which are in vogue are briefly reviewed, of these the weight-ratio methods are examined in greater detail in the present paper.

It is shown that the prevalent weight-ratio methods involve the assumption that the variation of weight along the length of a fibre is negligible. This assumption has been found to be invalid by the recent work carried out at the Technological Laboratory and it is shown that if this wrong assumption is made the average length as found by the weight-ratio method is bound to be considerably less than the correct value.

A new method, which remedies the above defect, is described in this paper. The essential features of this method consist in cutting a representative tuft of fibres, with one end in alignment, into three parts, the first part extending to a known length from the aligned end, the second part also having a known length, and the third part containing fibres of different lengths. The three parts are separately weighed. The average length of the third portion is computed by multiplying the ratio of the weight of the third part to that of the first by the known length of the first part. The average length of the whole tuft is obtained by adding up the individual lengths of the three parts. Furthermore, the fibre-weight per unit length may also be determined by counting the number of fibres in the first section prior to weighing and dividing the weight of the tuft by the number of fibres and the average length.

An apparatus, which is designed to carry out the tests accurately and rapidly, is described in this paper. The results of average length determined with the help of this apparatus are given along with those obtained by the older methods, and the agreement is found to be very satisfactory.

(6) *Miscellaneous Publication* —“*A Device for Mounting Cotton Hairs for Examination of Fibre-Maturity*”—This note describes a microscopical device which facilitates the examination of the maturity of cotton hairs.

(7) *Miscellaneous Publication* —“*A Note on a New Type of Progressive Damage to the Structure of Cotton Hair caused by Micro-organisms*”—While investigating the causes of deterioration of Broach Cotton, a type of damage to the structure of cotton fibre was discovered which does not appear to

have been described by the earlier workers. The chief characteristics of this damage are that (1) it commences from the usual seat of organismal infection i.e. the basal end or a tear in any other part of the fibre and (2) it slowly progresses internally disintegrating and corroding the cell wall leaving intact merely cuticular sheath. The cell wall gradually tapers from the unaffected portion into the affected one. Nine photo-micrographs are reproduced in support of the observation.

(8) *Technological Leaflet No. 6 The Influence of Method of Picking on the Quality of Cambodia Cotton*—Two samples of Cambodia cotton, grown in Salem (Madras Presidency) from the same seed and under as nearly identical conditions as possible were tested at the Laboratory. One sample was picked according to the method commonly employed by the local cultivators while the other sample was picked according to the improved method recommended by the Madras Agricultural Department. In the former method the coolies are allowed twice a week usually to collect the seed-cotton in gunny bags, regardless of whether they are fully ripe or immature. In the improved method, the cultivators are advised to pick the bolls only from the fully opened and mature bolls and to leave the locules in the plant itself. This method is not only cheaper and less wasteful than the old one followed by the cultivators but also yields lint of better quality. The results of the tests carried out on these two samples showed that the sample picked according to the method recommended by the Agricultural Department was superior to the other sample in every respect. It contained a higher percentage of mature fibres, gave 3 per cent less total loss in the opening and cleaning processes, registered fewer breakages in the ring frame and the yarns spun from it were definitely stronger and less neppy than those given by the sample picked according to the cultivators' method. Thus the cotton picked by the improved method had gained both in grade and quality and the agriculturists would stand to gain materially by following the method recommended by the Department.

V GENERAL.

Visitors—His Excellency the Governor of Bombay very kindly paid a visit to the Laboratory on 6th April 1930. He was received at the Laboratory by Sir Purshotamdas Thakurdas, Mr. Rama Reddi and the writer who conducted him round the various sections of the Laboratory and showed him the work which was being done in each section. His Excellency evinced very great interest in the work of the Laboratory and put numerous questions regarding the condition of the Indian cottons in general and the application of the Laboratory's results to it in particular. His Excellency's visit was originally planned to last for about three-quarter of an hour but owing to the deep interest he took it actually lasted for an hour and a half after which he was pleased to express his appreciation of the work seen by him.

The Hon'ble Kunwar Sir Jagadish Prasad, Kt , C I E , O B E , Member of the Viceroy's Executive Council in charge of the Education, Health and Lands Department visited the Laboratory on the 10th January 1936

The Hon'ble Chowdhry Sir Mohamed Zafrullakhan, Kt , Member of the Viceroy's Executive Council in charge of the Department of Commerce and Railways visited the Laboratory on the 23rd July 1936.

Among the others who visited the Laboratory during the period under review mention may be made of the following —

- (1) 25 Post-graduate students of the Royal Institute of Science, Bombay
- (2) 52 students and 4 teachers of the Agricultural College, Poona
- (3) 16 students of the Government Textile School, Cawnpore.
- (4) Fellows of the Academy and Members of the Reception Committee of the Indian Academy of Sciences
- (5) 15 Research Students of the Physics Laboratory of the Dacca University, Ramna
- (6) 19 First Year B Sc students of the Allahabad Agricultural Institute, Allahabad
- (7) 27 students of the Baroda Agricultural School, Baroda
- (8) 15 students of the Kala-Bhavan Technical Institute, Baroda

The Technological Assistants working at the mofussil laboratories attended the Laboratory with the exception of Mr S Rajaraman, Technological Assistant, Lyallpur, in December 1935 for the Refresher Course and the Conference. The Conference of the Senior Members of the Laboratory and the Technological Assistants took place on the 6th and 7th December 1935

Staff — Details regarding the technical staff employed in the Laboratory will be found in *Appendix XV*, while leave and other arrangements made during the period under review are mentioned below

Mr D L Sen proceeded on study leave to join the College of Technology, Manchester, on the 20th September 1935

Mr Hari Rao proceeded on leave from the 14th April 1936 to 23rd May 1936 and in his absence Mr R S Koshal supervised the work of the Fibre Testing Section.

Mr V Venkataraman Statistician and Personal Assistant was given leave on medical certificate from the 9th March 1936 to 12th June 1936 during which period his post remained vacant

Mr A. N. Gulati Microscopist was on leave on medical certificate from 15th April 1936 to 1st July 1936

Mr A. B. Khan Junior Tester resigned his post on 3rd September 1936 to prosecute further studies and Mr S. N. Rao was appointed in his place

Mr S. Raja Raman Technological Assistant Lyallpur completed his training at the Laboratory on the 11th September 1935 and proceeded to Lyallpur to join his duties. Mr K. G. Deo who was transferred to Lyallpur to officiate as Technological Assistant reverted to his substantive post of Junior Tester in the Laboratory

In order to cope with the increase in the work of the fibre and the yarn testing sections provision for four posts of temporary Junior Testers for a period of three months each had been made in the current year's budget. These posts were filled by the appointment of Messrs B. N. Prabhakar, S. M. Nawaz, J. S. Deshpande and G. Hurry who worked in the Laboratory from the 2nd December 1935 to 1st March 1936.

As in the past two students from outside Messrs S. Dinakaran and B. V. Vora were selected for training at the Laboratory from 2nd December 1935 for a period of six months. Their period of training expired on the 31st May 1936.

During the period under review two Research Scholarships were awarded to Messrs G. Ram Rau and M. U. Parmar and they joined duties on the 20th and 16th January 1936 respectively.

Mr W. D. Saleem was appointed Junior Tester to fill up the post rendered vacant due to the resignation of Mr M. R. Raut.

Mr B. N. Prabhakar was appointed on the 14th April 1936 as Junior Tester to fill up the post rendered vacant due to the resignation of Mr W. D. Saleem.

Mr V. Venkataraman continued to hold the temporary post of Personal Assistant in addition to his own duties.

Mr H. B. Joshi continued to be in charge of the Yarn Testing Section.

The working hours of the Laboratory were increased by one hour from 15th August 1936.

Equipment—During the period under review the following machines and apparatus were added to the equipment of the Laboratory.—

(a) *Machines*

- (1) One Shirley Analyser
- (2) One Fractional H P Motor.

(b) *Apparatus*

- (1) Leeds and Northrop Galvanometer
- (2) Bosch and Lomb's Euscope with adjustable microscope lamp
- (3) One Protractor eye-piece with adaptor.
- (4) Dr J Saxl's Evenness Tester

ACKNOWLEDGMENTS

It gives me pleasure to express my deep sense of gratefulness to the office-bearers of the Indian Central Cotton Committee for their unfailing support and valuable suggestions, to Mr Varjivandas Motilal for his kindness in valuing the cotton samples, to the office bearers of the East India Cotton Association and the Millowners' Associations of Bombay and Ahmedabad for their help in supplying samples of trade varieties. My best thanks are also due to the staff of the Laboratory for their loyal co-operation and many fruitful suggestions which made it possible for me to complete the work described in this report

NAZIR AHMAD,

Director,

Technological Laboratory

Dated the 24th November 1936

CHAPTER VII

REPORT OF THE PUBLICITY AND PROPAGANDA OFFICER FOR THE YEAR ENDING 31st AUGUST 1936

INTRODUCTION

THE Indian Central Cotton Committee's Publicity and Propaganda Department has made steady progress during the period covered by this Report in interpreting and broadcasting to the public both in India and abroad, the facts and recommendations arising out of the scientific research work carried on under the auspices of the Committee. The Department has directed its efforts along two main channels firstly wide press publicity both in India and abroad for disseminating knowledge of improvements effected in the quality of Indian cottons and secondly vigorous field propaganda by the Publicity Officer in person in collaboration with Provincial Departments of Agriculture in furtherance of regional campaigns for dealing with specific cotton problems. Under the first category fall the Committee's varied schemes both scientific and practical so that the interested public could lay its hands on them quickly and easily. In the second group are included propaganda tours in different provinces of India to carry the fruits of experimental work to the grower and other interests concerned.

ANTI GOGHARI PROPAGANDA.

The notable event during the year under report was a determined drive initiated by the Department of Agriculture, Bombay, with the Committee's active co-operation to eliminate the inferior cotton known as *Goghari* from the Surat tract. This type of cotton has been found to be undesirable not only in itself but also because it is mixed with superior varieties thereby spoiling the reputation of one of the finest Indian cotton, *Narsari* 1027 A.L.F. The united efforts of the Department of Agriculture Bombay and the Indian Central Cotton Committee to eradicate this inferior variety of cotton from the Surat tract met with only partial success. The main factor which stood in the way of complete success was the higher ginning percentage of the inferior variety. The trader encouraged mixing of the two varieties so as to be able to palm off the mixture as genuine *Narsari*.

To put an end to this evil practice of mixing legislative prohibition for cultivation of *Goghari* was considered the only means. The Bombay Government accordingly brought forward the bill to prohibit the cultivation of *Goghari* cotton and the mixing of such cottons with other cottons, etc etc which has since become law.

In the work of securing the support of the members of the Bombay Legislative Council for the measure, the Publicity Department played its part. An illustrated pamphlet, a hand bill and a special article were prepared and distributed to the members at Poona and at the extended session of the Council in Bombay.

A special demonstration was staged in a large *shamiana* in the compound of the Council Hall at Poona. Samples of 1027 *A L F*, *Goghari* and mixed *kapas*, yarn exhibits, etc., prepared at the Committee's Technological Laboratory at Matunga, were placed on view, together with Baer patterns of 1027 *A L F*, *Goghari* and mixture, combed halos of 1027 *A L F* and *Goghari* and photos, charts, graphs, diagrams, pictures, etc., showing the characters and monetary value of the two varieties as well as of their mixture. The demonstration was organised in a manner calculated to please as well as instruct at a time when the session of the Legislative Council was in progress and was acknowledged to be a source of enlightenment and profit to the members representing agricultural, trade and industrial interests.

A similar demonstration, although on a smaller scale, was held at the extended session of the Council in Bombay which finally passed the measure into law.

The *Times of India*, the *Bombay Chronicle* and local vernacular papers evinced great interest in this important measure and published a special article on the subject. The *Times of India* made appreciative editorial comments upon the Publicity Department's unceasing campaign for educating the members of the Council on the urgent need for the measure.

Following on the passage of the Bombay Cotton Control Bill of 1935 and a similar bill penalising *Goghari* cotton in Baroda and in pursuance of the decision taken by the Committee at its 32nd meeting to pursue propaganda work against *Goghari* in the district of Surat and Navsari *Prant*, the Publicity Officer devoted a large portion of his time in the preparation of illustrated pamphlets, the anti-*Goghari* poster "Get rid of the weight", placards, etc., to help forward the campaign and extend it to villages. Rightly alert to the much desired elimination of inferior *Goghari* the officers of the Agricultural Departments of Bombay and Baroda had before the big drive was launched carried on in the past the educational work in territories south of Nerbudda river, from Ankleshwar to Bilimora, Vyara and Anawal in the Surat district and in the Navsari *Prant* in the Gaekwar's territory, inducing cultivators to grow the pure 1027 *A L F* type, in wake of the pioneering attempts of Sir Purshotamdas Thakurdas, Vice-President of the Indian Central Cotton Committee, who was the first to stress the need of putting a complete stop to the growing of *Goghari* and to seek Government's co-operation in enforcing measures to that effect. But in spite of it, *Goghari* assumed alarming proportions in some villages of Jalalpur Taluqa and Navsari *Prant*.

Supplementing the above efforts the Publicity Officer of the Indian Central Cotton Committee accompanied by the Cotton Superintendent Surat and Cotton Officer Narsari and the staff carried out a campaign of propaganda visited a large number of centres and villages in the British and Baroda territories, addressed meetings of growers and interviewed ginowners merchants commission agents and export firms to unify the thinking and action acquainting them with facts about *Goghari*, the disadvantages of mixing the two varieties the necessity for checking the evil provisions of the Acts and their basic objects designed to improve the economic condition of the interests concerned by increasing the net return for cotton which was their mainstay and brought them more than 30 lakhs of rupees per year for their output of 1½ lakhs of bales from the cotton tract South of Verbhada river the work of the Indian Central Cotton Committee's schemes to improve and develop cottons in Surt and Baroda and their active co-operation in its endeavour to establish the reputation of the Narsari cotton which was highly prized in India and abroad for its fine long staple

The task of getting the cultivators to stop growing *Goghari* was colossal. It meant the displeasure of ginning interests the formulation of a new policy giving actual effect to it and the broad principle involved. One of the most important steps was to plan and get under way far reaching propaganda campaign designed to reach every grower and ginner of *Goghari* whom it was possible to reach and to convince them of the advantages of keeping
1027 A.L.F. pure

By giving talks by issuing literature, displaying posters distributing placards and by personal interviews and other available mediums public opinion in favour of the measures was successfully mobilized which contributed towards better understanding of the concerted action of the Departments of Agriculture and the Indian Central Cotton Committee even in remote villages

The co-operation of the Press to help forward the campaign in the districts was again noteworthy. Interviews to the press correspondents were given and these resulted into the *Times of India* reproducing poster Get rid of the weight twice with a descriptive note regarding the poster and an account of the work which was being done in Surat and Baroda for the improvement of cotton

The *Gujerati* of Surat and *Sayaji Nyaya* an official organ of Baroda State besides reproducing the poster wrote leading articles in support of the campaign. An account of the activities of the Committee's Publicity and Propaganda Officer in affected areas was also published.

Literature was supplied to the Press and by these means a good press and general publicity was secured

The programme of the campaign was immediately successful and the response from the interests connected with cotton was very fine and encouraging

EXHIBITIONS

There are no better mediums than exhibitions and fairs in the civilised countries all over the world as the most effective and important means of knowing how far and in what manner the industries and commerce of a nation are able to meet the demands of its life, whether articles manufactured for the use of a people are of a right quality and type

One such notable exhibition in which the Publicity Department of the Committee participated was the Rural Life Exhibition at Baroda which lasted for two weeks commencing from the 1st January, 1936. This Exhibition was organised in celebration of the Diamond Jubilee of H. H. the Maharaja of Baroda, and represented a true picture of life springs of agricultural, commercial and industrial development made in that part of the country and an object lesson for the systematic dissemination of those facts which are of the greatest value to the producer, the consumer and the distributor

The exhibition attracted thousands of visitors, farmers, merchants, manufacturers and members of every class of society.

Occupying as it did an extensive *maidan*, the exhibition was able to accommodate hundreds of stalls. Side by side with the show of the Agricultural Department the stall of the Indian Central Cotton Committee was organized in a striking manner to fulfil a mission of no small significance, namely, to make known to the public the eminent part the Indian Central Cotton Committee was playing in the agricultural and industrial advancement of the country. A number of cotton exhibits kindly placed at the department's disposal by the Director of the Technological Laboratory, a large number of photos and charts showing the superiority of 1027 *A.L.F.* cotton over *Goghari*, posters and other publications of the Publicity Department were on view at the exhibition. The Committee's participation was a great success and numerous comments were heard from cotton interests and the general public who thronged the stall, that so noticeable an improvement has already been achieved in the quality of cotton and that such great schemes were being financed by the Committee for the extension of improved varieties of cotton. In fact, the Publicity Stall, without exaggeration, proved to be a great educational agency in the dissemination of knowledge of the Committee's outstanding activities at a comparatively small cost. In appreciation of the good propaganda work done by the department the Exhibition Committee granted a certificate to the Committee.

2 *All-India Industrial Exhibition, Delhi*

A sufficient number of posters, pamphlets and other publications which were considered to be of use in Northern India were sent for use in the exhibition. The Publicity Officer who at the time was engaged in the preparation of propaganda material for Surat and Baroda campaigns was

unable personally to take part in the exhibition. The Secretary of the exhibition in a letter on the usefulness of posters and literature of the department said. The posters were interesting and always there was a big crowd at places where the posters were displayed. The literature also seemed to have effected good results because it contained valuable information and people liked to receive the literature with great interest.

3 *The Fair in Rajputana*

At the request of the Extension Officer of the Institute of Plant Industry Indore. Publicity and Propaganda literature and posters of the Publicity Department were supplied for demonstration and distribution purposes at the fair.

Crop Demonstration in Amraoti and Yotmal

At the request of the Extra Assistant Director of Agriculture Amraoti suitable propaganda literature was sent to him for use in connection with the demonstration of improved crops held in Amraoti and Yotmal districts.

4 *Fairs and Demonstration in Warora Central Provinces*

Publications of the Department were also supplied to (1) the Agricultural Assistant Warora Central Provinces and (2) the Deputy Director of Agriculture Gujarat in connection with village uplift work in several villages which were visited by H. E. the Governor of Bombay.

PRESS COMMUNIQUE

The following press communiqués were issued during the year under report —

- 1 *Elimination of Goghari cotton from Sural tract*
- 2 *Development of cotton cultivation in Sind*
- 3 *Combining of good quality Indian cottons*
- 4 *Development of cotton growing in Bombay Presidency*
- 5 *Facilities for training at the Technological Laboratory, Matunga*
- 6 *Amalner Cotton Market*
- 7 *Fibre-maturity in relation to fibre and yarn characteristics of Indian cottons*
- 8 *The 31st Half yearly meeting of the Indian Central Cotton Committee*
- 9 *The 32nd Half yearly meeting of the Indian Central Cotton Committee*
- 10 *Improved varieties of cotton in Sind and their cultivation.*
- 11 *Review of last year's developments*
12. *Seed distribution and extension schemes*
- 13 *Improvement of cotton in India*
- 14 *Review of the brochure on cotton research in India*
- 15 *Effects of storing cotton bales in the open and inside a shed at Karachi*

SPECIAL ARTICLE.

Elimination of Goghari cotton from Surat tract .—This special article was issued to bring home to the members of the Bombay Legislative Council, the agriculturists in Surat and the trade in general the necessity for the eradication of *Goghari* cotton from the Surat tract, in view of the great damage done to the reputation of the superior variety 1027 *A L F* by the mixing of both the varieties and passing the mixture off as genuine *Navsari* cotton. Legislative intervention was the only means of salvaging the reputation of the *Navsari* cotton.

PAMPHLETS

In addition to press *communiqués* and special article, the Publicity and Propaganda Department published pamphlets, leaflets, etc., setting forth results of study of a number of cotton problems. The pamphlets issued were

- 1 “*Elimination of Goghari from the Surat tract will re-establish the reputation of Navsari cotton*”

This pamphlet explains the superiority in quality and value of *Navsari* 1027 *A L F* cotton as compared with *Goghari*, the disadvantages of mixing these two varieties and the views on the question of those affected by the evil of mixing. This pamphlet was specially prepared in connection with the anti-*Goghari* propaganda campaign launched by the department, when the question of elimination of *Goghari* cotton from the Surat tract was before the Bombay Legislative Council.

- 2 A Gujarati version of this pamphlet was also brought out for propaganda in the Baroda State.

- 3 “*Spotted Boll-worms (Earias Fabia insulana) in South Gujarat.*”

This is a popular thoroughly illustrated edition of the bigger scientific monograph published by the Imperial Council of Agricultural Research. This deals with the results of the Surat Entomological Scheme and describes the investigations made from 1923 to 1934 on the Spotted Boll-worm in South Gujarat in order to study the life and habits of this important pest of cotton and the estimation of damage caused by it. It also includes a summary of the clean-up campaign organized in the Broach district to determine the efficiency of control measures.

- 4 “*The Indian Central Cotton Committee, its objects, activities and achievements*”

This pamphlet gives a comprehensive description of the Committee's varied activities and its achievements in the legislation designed to promote the production, marketing and manufacture of Indian cottons and in the sphere of research.

In order to reach a wider public this pamphlet was translated from English into the provincial languages such as Marathi Gujarati Urdu Hindi Tamil and Telugu

5 *Summary Proceedings of the 32nd meeting of the Indian Central Cotton Committee*

This was an impersonal summary setting forth the main points brought out during discussions without mentioning the names of the speakers.

6 A handy illustrated pamphlet is under print setting forth the aims and achievements of the Indian Central Cotton Committee for distribution during the forthcoming United Provinces Industrial and Agricultural Exhibition at Lucknow

POSTERS

Get Rid of the Weevil

The four-coloured poster was specially prepared to help forward the campaign for the elimination of *Gophers* from the Surat and Baroda tracts. It is a vivid picturization of the handicap which *Gophers* constitutes to the cultivators efforts to obtain better prices for his product. It lends point to the exhortation to get rid of the short staple variety of cotton grown in Surat and Baroda which is greatly responsible for the deterioration in the quality of 1027 A.L.F.

The preparation of a suitable poster for *B D 8* cotton in Gujarati was also taken in hand.

The idea of replacing the poster *India's bid for Supremacy in world's Cotton Markets* with a different attractive design and latest available figures was also taken in hand. To cope with the immediate demand for this poster a number of copies of the old edition was brought up-to-date and printed.

LEAFLETS

The Gujarati leaflet on the uses of plant puller was reprinted a third time to meet increased demand from Baroda and other places.

HANDBILLS

1 The Plant Puller handbill was also reprinted a third time in Gujarati in order to meet heavy demand from the Director of Agriculture, Baroda.

2 “*Save Indian Cottons*”

The handbill was prepared in connection with the efforts made by the Publicity and Propaganda Department to eliminate *Goghari*. A Gujarati version, with necessary modifications, was also prepared in connection with a similar campaign proposed to be conducted in Baroda.

PLACARDS

A placard explaining the gist of legislative measures prohibiting the growing of the *Goghari*, and directing the growers to obtain pure seed of 1027 *A L F* from nearest Government Depôts was also prepared in English and Gujarati.

DEMAND FOR PUBLICITY LITERATURE AND GREATER NUMBER OF ENQUIRIES.

The year now under review was remarkable for an increased demand for the publications of the Department as well as for special information bearing on the Committee's work. A large number of enquiries from Government institutions, trade associations, private concerns and interested individuals were attended to. Its help was sought for information on scientific investigations, based on the latest knowledge of marketing and other problems in connection with the improvement and export of Indian cotton. These enquiries encouraged the belief that the widening of the informational service has attracted increasing attention from both the trade and the general public, here and abroad.

PUBLICITY OFFICER'S TOURS

During the year under report the Publicity and Propaganda Officer paid visits to Poona, Surat, Baroda and Navsari and toured through many centres of the Surat district and Navsari in connection with the *Anti-Goghari* campaign. Such journeys helped him to keep in touch with cotton interests and opinions and by virtue of his office also to contribute towards a better understanding of the Committee's work for the improvement of cotton in India, carry on field propaganda in the districts, and to offer them the services of the Department in this respect. With the help of the Officers of the Department of Agriculture, Bombay and Baroda, the Publicity and Propaganda Officer followed a rationally adjusted working plan for the campaigns that made the most effective success, as reflected in the earlier pages of this report.

APPRECIATION OF COMMITTEE'S WORK

In assessing the value of the Committee's work, several newspapers, both in India and outside, have from time to time written in appreciative terms. For instance, the *Times of India*, commenting on His Excellency

the Governor's address at the 31st half yearly meeting of the Indian Central Cotton Committee in which His Excellency referred to Lancashire's readiness to make more use of Indian cotton, if uniformity in quality was assured observed as follows

to this persistent publicity and propaganda are essential the Indian Committee are awake to this need. Its Publicity and Propaganda Department has been instrumental in checking to some extent the evils formerly prevalent in the cotton trade. Particularly successful was its campaign for the elimination of the boll worm pest in Surat which adversely affected the quality of the local crop. Its task will be considerably lightened by the legislative measures shortly to be undertaken and the result should be an appreciable improvement in both the quality and quantity of Indian cotton supplies. That in itself most justifies the existence and labours of the Indian Central Cotton Committee.

His Excellency the Governor of Bombay while addressing the 33rd half yearly meeting of the Indian Central Cotton Committee on August 18, 1930, made reference to Publicity and Propaganda work of the Committee in the following terms. Through its propaganda agency your Committee with the immense authority of its store of knowledge and experience wields a great power for the improvement of the cultivation and trade of this Presidency. Bombay is above all the cotton province of India and any improvement in production, marketing or export will benefit a very large section of the population. The difficulty in the way of improvement is very largely that of convincing growers and traders of the resultant benefits. The cultivator is naturally conservative. It is indeed hardly reasonable to expect him to display much individual originality and initiative. Demonstration and propaganda are necessary to convince him that it pays in the long run to spend more on better seed, to root up old cotton stumps and to keep cotton free from admixture of inferior kinds and of dirt and rubbish. The Committee is admirably equipped for this purpose and has already done much by bringing home directly to the guilty party any departure from the specified standard of quality in cotton bales.

R. D. MIHRA,
Publicity and Propaganda Officer

APPENDIX I.

MEMBERS OF THE COMMITTEE.

(1) PRESIDENT —

Sir Bryce Burt, Kt., C I E, M B E, I A S, Offg Vice-Chairman, Imperial Council of Agricultural Research, *ex officio*

(a) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex officio*

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS —

<i>Madras</i>	.. M R Ry Rao Bahadur D Ananda Rao Garu, I A S
<i>Bombay</i>	The Director of Agriculture
<i>United Provinces</i>	Mr J H Ritchie, I A S, Director of Agriculture
<i>Punjab</i>	The Director of Agriculture.
<i>Central Provinces</i>	Mr J C McDougall, I A S., Director of Agriculture
<i>Burma</i>	Mr F D Odell, I A S, Deputy Director of Agriculture, West Central Circle, Magwe

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS—

The East India Cotton Association	Sir Purshotamdas Thakurdas, Kt, C I E, M B E (<i>Vice-President</i>)
The Bombay Millowners' Association	Mr S D Saklatvala, M L C
The Bombay Chamber of Commerce	Mr M S Durutti
The Indian Merchants' Chamber	Mr Chunilal B Mehta
The Karachi Chamber of Commerce	Mr A P Darlow
The Ahmedabad Millowners' Association	Seth Sakarlal Balabhai, M L C
The Tuticorin Chamber of Commerce	Mr J Vonesch
The Upper India Chamber of Commerce	Mr J Tinker
The Empire Cotton Growing Corporation	Mr W Roberts, C I E

(5) AND (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS—

<i>Central Provinces</i>	{ Mr Y G Deshpande Mr D K Kane
<i>Madras</i>	Mr J Nuttall
<i>Punjab</i>	Khan Bahadur Sardar Habibullah, M.L.C.
<i>Bengal</i>	Mr Akhil Bandhu Guha

(7) CO-OPERATIVE BANKING REPRESENTATIVE—

Sir Chunilal V Mehta, K.C.S.I

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY—

<i>Madras</i>	{ Mr K. S. Ramaswami Gownder M.R. Ry Rao Bahadur B. P. Saha Reddi Garu M.L.C
<i>Bombay</i>	{ Sardar Rao Bahadur Bhimabhai Ranebodi Yalk, M.L.C. Rao Bahadur C. S. Shirahatti
<i>United Provinces</i>	{ Khan Bahadur Shah Nazar Hussain, M.L.C. Rao Bahadur Lala Anand Sarup M.L.C.
<i>Punjab</i>	{ Sardar Sahib Gurbachan Singh, M.L.C. Mian Nurullah, M.L.C.
<i>Central Provinces and Berar</i>	{ Rao Bahadur M. G. Deshpande C.I.E. Mr M. P. Kothar M.L.C.

(9) AND (10) REPRESENTATIVES OF INDIAN STATES—

<i>Hyderabad State</i>	Mr Nizam-ud Din Hyder Director of Agriculture
<i>Baroda State</i>	Mr R. G. Allan, C.I.E., Commissioner of Agriculture
<i>Gwalior State</i>	Mr H. H. Pandya, Director of Agriculture
<i>Rajputana and Central India States</i>	Vacant.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL-IN-COUNCIL—

- 1 Mr D. V. Mahta, Economic Botanist for Cotton, Central Provinces.
- 2 Rao Bahadur S. S. Salimath, Deputy Director of Agriculture Southern Division, Dharwar.
- 3 Dr V. K. Badami, Ph.D., Deputy Director Department of Agriculture in Mysore State Bangalore.
- 4 M.R.Ry V Ramanatha Ayyar A.L., Cotton Specialist Coimbatore.
- 5 Musahib-i-Khas Bahadur S. V. Kanungo Finance Minister Holkar State, Representative of the Holkar State.
- 6 Mr W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind, Karachi.
- 7 Seth Iswordas Varidmal, Representative of the Karachi Indian Merchants' Association.
- 8 Mr P. B. Richards, I.A.S., Entomologist to Government United Provinces.
- 9 Mr Sayed Miran Muhammad Shah, M.A.C., 60 Cantonment, Hyderabad, Sind.
- 10 Khan Babob Farrukhbeg Badikalibeg Mirza Nawabshah, Sind.
- 11 Lala Shri Ram, Representative of the Cotton Millowners of Delhi.
- 12 Mr Chellaram Showaram, Representative of the Karachi Cotton Association, Ltd.
- 13 Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

Also Nominated by Mr T. R. Low I.A.S.

APPENDIX II.

CONSTITUTION OF SUB-COMMITTEES

STANDING FINANCE SUB-COMMITTEE

Sir Bryce Burt (<i>ex-officio</i>)	Mr J Vonesch
Sir Purshotamdas Thakurdas (<i>Chairman</i>)	Mr Chunilal B Mehta
Mr S D Saklatvala	Mr A P Darlow
Sardar Rao Bahadur Bhimbhai Ran- chodji Naik	Sir Chunilal V Mehta
	Mr M S Durutti

LOCAL SUB COMMITTEE

Sir Bryce Burt	Mr J Vonesch
Sir Purshotamdas Thakurdas	Mr Chunilal B Mehta
Mr S D Saklatvala	Mr A P Darlow
Sardar Rao Bahadur Bhimbhai Ran- chodji Naik	Sir Chunilal V Mehta
	Mr M S Durutti

COTTON GINNING AND PRESSING FACTORIES SUB COMMITTEE

Sir Purshotamdas Thakurdas	Mr J Tinker
Mr S D Saklatvala	Mr J Nuttall
Mr J Vonesch	Mr W Roberts
Mr Chunilal B Mehta	Mr Y G Deshpande
	Vacant (two seats)

The Co operative Banking Representative—Sir Chunilal V Mehta, and
Mr Chellaram Shewaram—(*Co opted Member*)

AGRICULTURAL RESEARCH SUB-COMMITTEE

- I *The President*—Sir Bryce Burt
- II *The Vice-President*—(*ex-officio*)
- III *The Director, Institute of Plant Industry*—(*ex-officio*)
- IV *The Co-operative Banking Representative*—Sir Chunilal V Mehta (*ex-officio*)
- V *Cotton Growers' Representatives*—Mr W Roberts, Mian Nurullah, Vacant (one seat)
- VI *Cotton Trade Representatives*—Mr Chunilal B Mehta, Vacant (one seat)
- VII *Agricultural Officers*—Dr W Burns, Mr J H Ritchie, Mr H R Stewart, Mr V Ramanatha Ayyar, Mr R G Allan, Mr W J Jenkins, Rao Bahadur D Ananda Rao Garu, Mr D N Mahta, Mr P B Richards, Mr J C McDougall, Mr Nizam-ud Din Hyder, Mr H H Pandya, Dr V K Badami, Vacant (one seat)
- VIII *Co-opted Members*—Mr Mohammad Afzal, Rai Saheb Kalidas Sawhney, Mr J B Hutchinson, Mr Chellaram Shewaram, and
- IX *The Secretary*

TECHNOLOGICAL RESEARCH SUB-COMMITTEE

The President (<i>Ex-officio</i>)	Mr J. Tinker
Sir Purnendramdas Thakurdas	
Dr W. Burna	Mr M. S. Dorais
Mr H. R. Stewart	Mr V. G. Deshpande
Mr Chennilal B. Mehta	
Reth Kakarilal Balabhai	Lala Shri Ram
Rao Bahadur D. Ananda Rao Garu	Mr N. Hossain (<i>Chairman</i>)
Mr S. D. Bakhtwala	Dr Nasir Ahmad
	Vacant (one seat.)
Mr A. D. Walwyn, Mr Dharamdas Mulraj Khatri (Representing the Bombay Mill Owners Association.)	
Mr Kasturilal Lalbhai, Reth Channilal G. Parekh (Representing the Ahmedabad Mill Owners Association.)	
Mr R. G. Karaiya, Mr Jannardas Ramdas (Representing the East India Cotton Association, Ltd.)	
Reth Iswardas Varinimal, (Representing the Karachi Cotton Association, Ltd.)	

RESEARCH STIPENDIUM SELECTION SUB-COMMITTEE

The President.	Mr W. J. Jenkins.
The Vice-President	Mr J. C. McDougall
Dr W. Burna	Mr H. H. Pandya.
Mr H. R. Stewart.	Mr Nizam ud Din Hyder
Mr J. H. Ritchie	Dr Nasir Ahmad.
Mr R. G. Allan.	Dr V. K. Badami
Mr P. B. Richards.	
Rao Bahadur D. Ananda Rao Garu	Vacant (two seats.)

COTTON FORECAST IMPROVEMENT SUB-COMMITTEE

The President.		
The Director-General of Commercial Intelligence and Statistics, Calcutta		
The Director of Agriculture	Bombay Presidency	
Do.	do.	Punjab
Do.	do.	Madras.
Do.	do.	United Provinces.
Do.	do.	Central Provinces.
The Chief Agricultural Officer in Sind.		
The Director of Land Records, Central Provinces and Berar		
The Commissioner of Agriculture, Baroda.		
The Director of Statistics, H.E.H. the Nizam's Government.		
The Director of Agriculture, H.E.H. the Nizam's Government		
The Deputy Director of Statistics, Calcutta.		
The Agricultural Expert to the Imperial Council of Agricultural Research.		
Mr J. Vonesch.		
The Statistical Officer Board of Revenue, Madras.		

SPECIAL SUB-COMMITTEE ON WIDER MARKETS FOR INDIAN COTTON

The President	Mr J. C McDougall.
The Vice-President	Khan Bahadur Sardar Habibullah
Mr H R Stewart	Sardar Rao Bahadur Bhumbhai Ran- chodji Naik
Mr J H Ritchie	Rao Bahadur D Ananda Rao Garu.
Dr W Burns	Mr Nizam-ud Din Hyder
Mr S D Saklatvala	Mr W J Jenkins
Mr J Vonesch	Mr Kasturbhai Lalbhai, Seth Isserdas Varindmal, Mr R G Saraiya, (<i>Co- opted</i>)
Mr Chunilal B Mehta	Vacant (one seat)
Mr Y G Deshpande	
Mr W Roberts	

STANDARDS SUB-COMMITTEE.

- Mr W Roberts (Representing the Imperial Council of Agricultural Research)
- Mr Haridas Madhavdas, Mr Varjivandas Motilal (Representing the East India Cotton Association, Ltd)
- Mr A P Darlow, Mr Kisharam Lekhraj (Representing the Karachi Cotton Association, Ltd)
- Mr N M Deshmukh, Rao Bahadur G R Kothare, (Representatives of cotton growers of Berar Tract)
- Mr Himatlal Jagjiwandas Vadodara, Mr Vadilal Chunilal Doshi, (Representatives of cotton growers of Mathia Tract)
- Mr Akhubava Takhtsinghji Chudasama, Rao Saheb Kevalbhai Desai, (Representatives of cotton growers of Dhollera Tract)
- Mr Haribhai Jhaveribhai Amin, Mr Ardeskar Jamshedji Kapadia, (Representatives of cotton growers of Broach Tract)
- Sardar C B Naik Bahadur Desai, Rao Bahadur B L Patil (Representatives of cotton growers of Kumpta Tract)
-

APPENDIX III

LIST OF RESOLUTIONS

- "The Indian Central Cotton Committee avires with great satisfaction the Knighthood conferred on the acting President and tenders its cordial congratulations to Sir Bryon Dart on the high honour conferred on him."
- "This Committee desires to record its appreciation of the excellent work of the Lancashire Indian Cotton Committee. The large increase in the takings of Indian cotton in the last three years is a striking testimony to the efficiency of their organisation and propaganda."
- "That the Indian Central Cotton Committee avires with satisfaction the expeditious manner in which the Bombay Cotton Control Act was passed by the Legislative Council. It is confident that this piece of legislation will go a long way towards improving the quality of cotton of the Surat tract where Gophari has been spreading to an alarming extent and that the benefits to the grower expected from the Act will soon be realised."
- "That the recommendation of the Standing Finance Sub-Committee that the Government of India be requested to make permanent the present levy for the fumigation of American cotton of Rs. 2-00 per square bale and of Rs. 1-8-0 per round bale be approved."
- "This Committee desires to request the President to bring to the notice of the Government of India the great necessity of their devising necessary means without delay to ensure that Indian cotton is not cut out from foreign countries owing to changed financial and other economic conditions in such countries."
- "The Indian Central Cotton Committee congratulates the Bombay Government for the rapid progress they have made with the introduction of the Bombay Cotton Ginning and Pressing Factories (Amendment) Bill in the Bombay Legislative Council."
- "The Indian Central Cotton Committee endorses the recommendation of the Local Sub-Committee regarding the detailed provisions in the Central Provinces Cotton Ginning and Pressing Factories (Amendment) Bill for dealing with watering, excessive seed introduction of extraneous matter and mixing of different kinds of cotton."
- "The Committee resolves that the complaint from Dhulia be reported to the Government of Bombay for effective prevention of this sort of malpractices reported by means of the Bombay Cotton Ginning and Pressing Factories (Amendment) Act."
- "The Indian Central Cotton Committee desires to express its very great regret at the sudden and tragic death of Dr. F. J. F. Shaw and wishes to convey its most sincere sympathy to Mrs. Shaw and her family in their great loss."
- "The Indian Central Cotton Committee places on record its satisfaction that the Governments of Bombay and the Central Provinces have passed legislation for the control of cotton ginning and pressing factories. The Committee has no doubt that this measure will go a far way in suppressing the malpractices which are detrimental to the interests of the cotton grower as they mar the fair name of Indian cotton both in India and abroad and it now desires strongly to impress upon the Governments concerned the desirability of bringing the Act into operation at the earliest possible date in those tracts where its application is indicated. The Committee further hopes that it will be given an opportunity of commenting on the rules to be framed by Local Governments before they receive legislative sanction."
- "The Indian Central Cotton Committee urges on the Government of Hind the necessity of taking very early steps to make the Cotton Ginning and Pressing Factories (Bombay Amendment) Act effective in that province by framing rules as early as possible before malpractices become established in the newly developed cotton tracts of that province."

" That the Indian Central Cotton Committee notes with satisfaction the continued efforts of the Lancashire Indian Cotton Committee to extend the use of Indian cotton in Lancashire and trusts that the good work being done by that body will be of mutual advantage to both countries.

While appreciating the efforts made by the Lancashire Indian Cotton Committee to increase the use of Indian cotton and whilst expressing satisfaction that the figure of nearly 5 lakh bales has been reached the Indian Central Cotton Committee desires to point out that from statistics of counts of yarns of 20 and below produced in the United Kingdom the Committee believes that there is still much further scope for use of Indian cotton in the United Kingdom "

" The Indian Central Cotton Committee welcomes the action of the United Provinces Government in submitting the United Provinces Cotton Pest Control Act of 1936 to the United Provinces Legislative Council, and records its approval of the Bill

The Indian Central Cotton Committee records its opinion that the proposed legislation is in the interests of the cotton growers and the cotton trade of the United Provinces, and that effect should be given thereto as early as possible "

" This Committee is of opinion that it is necessary to extend the Cotton Ginning and Pressing Factories (Bombay Amendment) Act to the districts of East and West Khandesh and other tracts particularly in view of the fact that the Central Provinces Government has only recently passed a similar Act

The Committee also desires to draw the attention of the Government of Bombay that the Bombay Act as at present worded cannot prevent the mixing of cotton waste with cotton and, therefore, requests the Government of Bombay to take in hand the necessary amendment so as to prevent the mixing of cotton waste with cotton

The Committee also requests the Local Sub Committee to report as to other areas in the Bombay Presidency to which it would be desirable to apply the Act."

APPENDIX IV

INSTITUTE OF PLANT INDUSTRY INDORE.

Annual Report for the Year ending June 30th 1936

The Institute of Plant Industry is a Society registered under the Holkar State Societies Registration Act and its primary objects are:—

- (a) The investigation of all matters relating to the production and improvement of raw cotton in India
- (b) The agricultural development of the Indian States which are members of the Society
- (c) The training of officers and cultivators nominated by such States.
- (d) The training of advanced students nominated by the Indian Central Cotton Committee.

Its funds are derived entirely from subscriptions. In the financial year 1935-36 the Indian Central Cotton Committee made a grant of Rs. 97 600 and the member-States in Central India and Rajputana subscribed Rs. 67,335.

The Institute is subsidised by the Indian Central Cotton Committee primarily in order that it may act as a central research station for the elucidation of botanical and agronomic problems of cotton of too wide a nature to be attacked by ad hoc schemes. The Indian Central Cotton Committee has also a secondary interest in the Institute in its work for the improvement of variety and cultivation conditions of cotton in Central India and Rajputana.

The interests of the member-States lie in the investigation of the specific crop problems of their own territory and in the development and dissemination of better seeds and more efficient agricultural practices.

The interests of the Indian Central Cotton Committee and of the member-States are complementary and provide a very satisfactory balance to the work of the Institute.

The Governing Body of the Institute is representative of the Cotton Committee and the member-States, and its President is the Agent to the Governor-General in Central India, *ex-officio*. The Director of the Institute is also Agricultural Adviser to States in Central India and Rajputana, and in addition represents all those States upon the Indian Central Cotton Committee.

ADMINISTRATIVE AND GENERAL.

1 *General and Board of Governors Meetings*—The fourth General Meeting of Members of the Society was held on January 31st, 1936, when discussion took place on the question of amending the constitution to admit of membership of the Institute by bodies other than States and the Indian Central Cotton Committee. It was decided not to make such amendment for the present. At the close of the meeting the States representatives present elected the States of Barwan, Jalpur Dhar and Jodhpur each to provide a Governor for the ensuing three years.

The Board of Governors at its 16th Meeting held on the following day decided that on purely financial grounds they could not invite Mr P. K. Jackson, the Director of the Institute, to accept an extension of his contract which expired in July. The Board recorded by resolution their appreciation of Mr Jackson's devoted and able services to the Institute and its sincere regret at the impossibility of affording their continuance.

The report for the year ending June 30th, 1935, and the programme for the current year were approved, subject to any contraction in the programme made necessary by the Board's later decision that Budget provision for staff salaries in the oncoming financial year should be reduced by Rs 8,000. Thus the serious financial situation mentioned in the last report has become much more acute, and valuable specially trained staff have already been lost either by dismissal or resignation in anticipation thereof.

2 *Contributing Members of the Institute*—It is satisfactory to record the accession as Members of Chhatarpur and Karauli States, and the Sikar Illaqa of Jaipur State. The Ajmer Merwara District Board (which is at present precluded from membership by the terms of the constitution) is now contributing to the Institute, which has also received handsome donations (Rs 2,000) from the Nuwara Elhya Tea Estate Co., Ltd., for advisory services rendered, resulting in the successful adaptation of the Indoro compost process to Ceylon conditions. That a commercial firm should make such voluntary payments is clear proof of the value of this process and of the Institute's co-operation.

At the closing date of this report the following twenty-five States and Thikanas were members of the Institute, arranged in order of joining —

Indore	Tonk	Orchha
Dhar	Byawar	Jodhpur
Jaora	Barwani	Alwar
Datia	Bikaner	Khetri
Rutlam	Rewa	Bagli
Dewas (Senior Branch)	Jaipur	Jhabua
Sitaman	Bundi	Chhatarpur
Narsingarh	Partabgarh	Sikar and Karauli

Bharatpur State, under minority administration and with a heavy burden of debt, has been contributing at a specially reduced rate (about one-third of the normal) for an agreed period of five years. The administration, finding itself unable to pay at the standard rate, fixed by the Board of Governors, has withdrawn from membership.

Negotiations are in progress with a number of important States who desire to avail themselves of the manifold advantages of membership. In view of numerous suggestions that these advantages should be made available at a reduced rate it is perhaps desirable to draw attention to the extremely reasonable rate at present laid down. The contribution for State's membership of the Institute decided on by the Board of Governors and agreed to by the State's representatives thereon is Rs 100 per lakh of total revenue—a very small sum in relation to the paramount importance of agriculture to practically every State in India, and to the value of the Institute's assistance to any State wishing to enhance its revenue by increasing the income of its *ryots*, who themselves usually provide nearly all that revenue.

By way of illustration it is worthy of note that the Punjab, Madras and the United and Central Provinces expend from one-twenty-fifth to one-fortieth of their total revenue upon their Agricultural Departments. It is hardly to be expected, therefore, that an enlightened State administration should grudge one-thousandth of its revenue for the support of a central institution which has already done so much to provide new sources of wealth for States and their populations. It is a regrettable fact, however, that in few Indian States, whether small or large, does the development of their greatest industry receive the attention and support it deserves.

Those who are familiar with its record of discovery and application of solutions to the agricultural problems of its member-States will testify that the Institute has fully justified its existence. Its members in the past have profited much from the heavy capital outlay and the share of overhead expenses borne by the Indian Central Cotton Committee. It seems probable that circumstances will force that body to reduce its grants still further in the near future and therefore if serious reductions in the Institute's efficiency are to be avoided a much larger measure of financial support must be given by States.

3. *Staff and Students.*—The Geneticist and Botanist was absent on leave and deputation in Europe from 13th July to 6th October 1935, when he led the Government of India delegation to the Imperial Botanical Conference in August and was a member of the delegation to the Sixth International Botanical Congress in Amsterdam in September.

As a result of this absence and of a temporary reduction in staff in the Genetics and Botany Section for two months during the busiest season of the year the preparation of papers for publication has not been as rapid as it would otherwise have been.

Consequent on the retrenchment prescribed by the Board of Governors the Extension Officer (Mr M. L. Sakarva, L.A.G.) who was on five years deputation from the Department of Agriculture United Provinces, returned to his parent service a year before the expiry of his deputation and Mr Kuber Singh, B.A., for many years Plant Breeding Assistant, was appointed to the post and was replaced by Mr C. P. Dutt M.Sc. (Calif.).

Two posts of Junior Farm Assistant were abolished, and two of Research Assistant in the Chemistry and Agronomy Section remain vacant for lack of funds, in addition to others.

The uncertainty as to their future which unfortunately prevails in the minds of a number of the research workers in the Institute is not conducive to that steady application and calm atmosphere so essential for good work on intricate problems. What has been done by these workers is therefore all the more creditable.

The personnel of all Sections have worked with a vigour and enthusiasm which is most praiseworthy and which is due in no small measure to their realization of and pride in the fact that they are building up an organization which in many ways is unique in India, and which is commanding in an increasing degree the respect and attention of those of much older standing.

That numerous requests are received from highly qualified scientific workers both in India and abroad, to be allowed facilities at the Institute to carry out research work on a voluntary basis is a proof of the Institute's rising reputation. Most of these requests had to be refused, owing to limitations in accommodation and equipment but five such workers have been entertained during the year.

4. *Visitors.*—The Institute received the honour of visits by His Highness the Maharaja Scindia of Gwalior who devoted several hours to a thorough examination of the work in progress, and Their Highnesses the Maharajah of Dewas (J.B.) and the Raja of Salana.

On the occasion of the twenty fifth Session of the Indian Science Congress, held in Indore in January 1936 a special half-day excursion was arranged when more than 300 members and others visited the Institute. Special displays were made, illustrating all the Institute's activities, which were first explained in general terms by the Director and Heads of Sections, the guests afterwards visiting the laboratories, the farm and the Residency Area municipal refuse disposal ground where the Institute's compost process is used.

Among other visitors during the year were the following :—

Aslam Beg, Mr Revenue Secretary Jaora, Central India.
 Arada, Motilal H., Dewan, Sitamar, Central India.
 Bakshiwal, G. M., Engineer Cotton Factories, Udaipur Rajputana.
 Banerji, N., Home Minister Banars, Rajputana.
 Bayna, K. M., Assistant Commissioner of Excise, Commerce and Industry Indore.
 Benger U. R., Engineer Sajjan Mills, Ruttam.
 Bingley B. R., Registrar Co-operative Societies, Holkar State.
 Brahmochari, U., Kt., Rai Bahadur M.A., M.D., Ph.D., Calcutta.

- Burt B C, Kt, *Vice-Chairman*, Imperial Council of Agricultural Research, New Delhi
 Caton, A R, Indian Village Welfare Association, 4, Great Smith Street, London
 Dastur, R H, Cotton Physiologist, Agricultural College, Lyallpur
 Dhanda, H C, General Manager, Indore Electric Supply, Indore
 Dhar, N R, Professor of Chemistry, Allahabad University
 Dungray, K B, Senior Member, Court of Wards, Gwalior Government
 Engledow, F L, Professor of Agriculture, Cambridge University
 Fitze, K S, the Hon'ble Agent to the Governor-General in Central India, Indore
 Gaurihar, Jagirdar of Bundelkhand, Central India
 Gosaha, H N, Dewan Bahadur, Dewan and President, Council of Administration, Barwani
 Hiralal K Seth, Rai Bahadur, Rajya Bhushan, Managing Director, Rajkumar Mills Ltd, Indore
 Hulkoti, R Y, Acting Professor of Agriculture, Poona, with a party of 53 students
 Jasol, Kunwar Amar Singh of, Director of Agriculture and Grass Farms, Jodhpur, Rajputana
 Kanungo, S V, Finance Minister, Holkar State, Indore
 Kesarisingh, Chief Member of Council, Kishangarh, Rajputana
 Kibe, M V, Sardar, Indore
 Kripa Narain, Agricultural Officer, Udaipur, Rajputana
 Lalsingh, N, Revenue Officer, Sitamau, Central India
 Malaviya, Pt Madan Mohan, Vice-Chancellor, Benares Hindu University
 Mehta, Chunilal V, Kt, Ex-Executive Councillor to the Bombay Government
 Mill, A N R, Lt-Col, R.A.M.C., Mhow
 Misra, Champa Ram, Rai Bahadur, Dewan, Chhatarpur State, Central India
 Moonje, B S, Dr, Nagpur, Central Provinces
 Mulk Raj, Chief Revenue Officer, Dhar State, Central India
 Mulye, N B, Education Member, Gwalior State
 Murray, Kenneth G, San Francisco, U S A
 Nadkar, K, Dewan Bahadur, Dewan and President, Council of Administration, Dhar, Central India
 Nadkarni, M M, Manager, Sajjan Mills, Rutlam
 Nurullah, Mian, M L C, Lyallpur
 Niranjani Swaroop, Hawale Superintendent, Jodhpur, Rajputana
 Palaret, C R, Consulting Engineer, Bombay
 Patwardhan, K A, Assistant Master, Daly College, Indore, with parties of Kumars
 Phatarpekar, V S, Kamdar, Bagh Estate, Central India
 Pratap Narain, Kamdar of Gaurihar, Bundelkhand, Central India
 Purshottamdas Thakurdas, Kt, Vice-President, Indian Central Cotton Committee
 Rama Reddi, P H, Secretary, Indian Central Cotton Committee
 Rangaswami, G N, Millets Specialist, Research Institute, Combatore
 Rustamji, General Manager, Cotton Factories, Udaipur, Rajputana
 Sethi, M C, Professor of Botany, Forman Christian College, Lahore
 Shaw, F J F, Acting Agricultural Expert, Imperial Council of Agricultural Research, New Delhi
 Seth Girdhar Lal, Rajkumar Mills, Ltd, Indore
 Sinha, M Thakur, Revenue Member, Bundi, Rajputana
 Sitole, G R, Jagirdar, Gwalior State
 Sur Sinhi, K S, Director of Agriculture, Nawanagar State
 Tambe, S L, Rao Sahib, Commissioner, Malwa Division, Holkar State
 Tambey, G R, Ex-Dewan of Bagh, Indore
 Taylor, J T, Dr, United Church of Canada Mission, Indore
 Tongra, Gulab Chand, Seth, Indore
 Tsolakidis, P T, Agent, Messrs Ralli Brothers, Indore
 Udawat, G P, Superintendent, Model Farm, Beawar, Ajmere
 Uttam Narain, Pandit, Rai Bahadur, Dewan of Sailana, Central India
 Vonesch, J, C/o Messrs Volkart Brothers, Bombay
 Wade, E W, Lt-Col, R.A.M.C., D.A.D., M S (Hygiene), Poona
 Walchand Hirachand, Director, Kalam Sugar Works, Baramati, Poona

West, W. D., Geological Survey of India, Calcutta
 Wilkie D. C., the Rev and Mrs., Howwar Ajmere
 Yagna Narayan Aiyer A.R., M.A., Dip. Agri. (Cantab) Field Director of Agriculture
 Bangalore.

Yelwande, R. C., Revenue Minister Dewas (J. B.).

5 *Library*.—Accessions during the year were:—

Text-books and works of reference	41
Complete volumes of journals	140
Reports, bulletins, etc.	247

Eight new journals have been added to the list of periodicals taken in the Library. Loans of 165 books and journals were made to cotton research workers in India and agricultural officers of member-States. Exchange of publications was kept up with the Provincial Agricultural Departments of India and many foreign institutions. A book catalogue of the pamphlets, which occupy a very large space in the Library has been prepared according to authors, in addition to the author and subject card-catalogues. The classification of books and pamphlets on the Universal Decimal System has been completed. The binding of some sets of journals is up-to-date. Books and bulletins numbering 188 have been sold, to the value of Rs. 480.

RESEARCH WORK.

6. *Organisation*.—During the last few years an increasingly high standard of research work has been aimed at and attained. This will be seen in the ensuing pages, as well as in previous Reports, which describe a great deal of new work, much of it conceived on original lines, and nearly all with an immediate and clear practical end in view which in many cases has already been achieved.

This has been done in spite of the fact that the head of the Genetics and Botany Section could not be recruited until the end of August 1933, and of the financial uncertainty in the last two years, which has led to the loss of research staff on whose special training much time and care had been spent.

The revision in research policy introduced in 1932 has borne fruit abundantly. The research staff take great pains to keep abreast of the results of other workers in their subjects, and for this the abstract publications of the Imperial Agricultural Bureaux have been invaluable.

The fullest use is made of modern methods of experimentation and particular mention may be made of the applications of mathematics to the design of field and laboratory experiments, and to the statistical treatment of their results, which probably have been more thoroughly and extensively exploited at the Institute than by any other research organization in India. The statement below shows the extent to which, in field experiments alone, such methods have been utilized.

Randomised replicated field Experiments

	1932	1933	1934	1935	1936 (March)
At Indore	24	83	43	35	56
In States	33	87	142	178	96

The precision and rapidity with which results can be interpreted amply repay the extra trouble involved.

Statistical methods have also been applied with outstanding success, to plant breeding problems, and the new technique evolved enables degrees of superiority or inferiority to be recognised with accuracy several years sooner than has hitherto been possible. In the laboratory, too, the degree of accuracy of measurements and analyses can also be determined by similar methods, which are in regular use at Indore, though not commonly elsewhere.

The willing co-operation of the States and their officers in carrying out field trials sponsored by the Institute remains a feature worthy of much commendation. Owing to this, many items are now ripe for propaganda by them.

The Institute is once again indebted to the Provincial Departments of Agriculture in India for many courtesies and much assistance, and it is pleasing to be able to record that repayment in kind becomes increasingly possible. These remarks also apply to Agricultural Departments in the U S A, the French Colonies, Russia, Iran, and many parts of the Empire.

7 *Weather and its effects on Crops*—In Malwa the monsoon rainfall was close to the average of many years, the Institute recording 30.8 inches from June to September. July was the wettest month with 12.76 inches and in some parts recently sown cotton and other *kharif* crops were injured by heavy down-pours. On the whole, however, the season was good, and yields were much higher than in any year since 1930. The following table shows the contrast with the years 1933 and 1934, and illustrates the vagaries of the Malwa monsoon.

	1935	1934	1933
Pro-monsoon	1.67	0.10	0.60
June	5.97	10.72	10.09
July	12.76	8.08	14.75
August	4.83	21.17	14.44
September	7.24	15.96	10.35
October	1.52		0.91
November	0.34	1.40	0.19
Total	34.33	57.43	51.33

In the Nimar tract rainfall was light and ceased early, which affected the *rabi* crops. In parts of Bundelkhand heavy and continuous rains in the early monsoon seriously damaged crops. Most parts of Rajputana had rather more than a normal rainfall and good crops but Jodhpur was rather short and Bundi in excess.

There was no frost in Central India save in the northern States bordering Rajputana, where also there was no very severe damage to crops.

8 *Cotton—Botany and Genetics*—(a) *Classification of Gossypium*—Advantage was taken of the deputation of the Geneticist and Botanist to England to study the types of *Gossypium* in the Linnean Herbarium, and the collections of indigenous African cottons at Kew. The study of the Linnean types revealed considerable confusion in nomenclature, while the absence from the Kew collections of material from French Africa left certain obscurities in the relationships of the wild and cultivated African types. As it is of great importance that the classification, when published, shall be both complete and in a form acceptable to taxonomists as well as to cotton workers, it was considered desirable to clarify these two points before proceeding further. The status of the African cottons has been elucidated in correspondence with Prof. Aug. Chevalier, in Paris and a suggested

solution of the confusion in nomenclature has been referred to a systematic botanist for his opinion. It is hoped that it will be possible to publish in the course of two or three months.

(b) *Botanical Survey*.—The writing up of the survey of the cottons of Malwa and Nimar is almost complete. During the year the survey work of the section has been greatly extended. In connection with the Bengals Improvement Scheme a study was made of the indigenous cottons of Rajputana. Data of scientific interest have been included in the report of the survey of the cottons of Malwa and Nimar. The plant breeding material collected, which is of great promise has been included in the current year's experimental programme at Sriranganagar and at Indore. At the request of the Indian Central Cotton Committee a preliminary study was undertaken of the indigenous and introduced cottons of Kathiawar in order to determine the most profitable lines of attack on the problem of the improvement of the quality of Dholeras cotton. Extensive tours were undertaken at the times of harvest of the two types of cotton now under cultivation, Matheo and Wagad. The present status and botanical composition of the two crops was elucidated, and selections were made in both. It was established that: (1) The range of variation in Wagad is very much greater than in Matheo. This was predicted from the history of the two types. (2) If a *Arboreum* cotton is ever to be re-established in the present Matheo tract, it will have to be an early type bred by crossing Wagad with an early *Arboreum*, probably from Iran or Afghanistan. In this connection it may be observed that the elucidation of the status of the indigenous cottons of Africa has revealed the fact that *G. arboreum* types morphologically similar to those grown in Kathiawar are very widely distributed in the French Sudan and neighbouring areas. The possibility of obtaining thence types of value either directly or as parents for crossing will have to be borne in mind when the improvement of the *Arboreum* cottons of India is under consideration. (3) The possibility of improvement of the early hardy Matheo, though small on account of its low variability is by no means negligible but the finer types found in it were usually later than the coarse typical forms. This may be taken to indicate the influence by hybridisation of primitive *G. arboreum* types such as Rozi.

At its meeting held in January 1936 the Indian Central Cotton Committee voted money for the travelling expenses of a Botanist for a three months tour in Iran to collect promising early types of *Arboreum* cotton. The Institute agreed to provide the Botanist and to pay his salary. Arrangements are in progress for the Second Plant Breeding Assistant to proceed to Iran in September next.

Investigations into the possibilities of substituting medium for short staple desi varieties of cotton have yielded valuable results. The study of old literature has shown that desi cottons which would now be classed as medium or long staple were formerly grown in the Nerbudda valley and in parts of Rajputana, two areas which are now contributing largely to the embarrassing bulk of India's short-staple crop. The invasion of short-staple cotton in these two areas is quite clearly the result of the stimulus of the demand for high ginning types by the owners of power gins at a time when the mill industry was not in a position to pay an adequate premium for quality. A similar invasion of short staple cotton has occurred more recently in Kathiawar as a result of economic pressure for an early cash crop. Tours in all three areas have demonstrated beyond doubt that the old finer types exist in small quantities in the mixed crops at present grown, and only await isolation and the stimulus of an adequate premium for improved quality to regain their former position. Taxonomic studies have shown that this wave of short staple cotton which has submerged the cotton growing areas of North Western, Western and Central India is of the geographical race of *G. arboreum* var. *neglectum* which originated in the Eastern Bengal Assam cotton tracts. Only Malwa has escaped, and for the reason that the short stapled types are late in Malwa and do not give their crop before the incidence of frost. Malwa, however has succumbed to another invader a more or less naturalised form of *G. hirsutum* (an American Upland mixture, locally known as Cam bodia) which imparts a certain softness to the mixed lint, but is (in pure culture) a

Financed by the Indian Central Cotton Committee, for the study at Sriranganagar (North Sikar) of *neglectum* cottons of possible utility for the improvement of the coarse cottons of the Bengals tract.

low-yielding type, and is very ill-adapted to the predominantly *barani** cultivation of the tract. Its survival is probably very considerably assisted by the favour with which it is regarded by mills and gunneries.

(c) *Genetics*—(i) Further confirmation of Hutchinson's theory of the organization of the gene has been provided by the discovery of at least one more allelomorph in the leaf-shape series.

(ii) Studies on the fundamental genetic basis of the lint hairs are being carried on, and either four or five genes for "lintless" are now known.

(iii) Investigations on the problem of the interaction of genotype and environment have been facilitated by the discovery of the new Upland "crinkled". When grown under conditions of low humidity in a greenhouse in the hot weather, the Upland "crinkled" develops perfectly normally, while the Egyptian "wrinkled leaf" develops the crinkled leaf typical of the genotype. Under all other conditions, both Upland "crinkled" and Egyptian "wrinkled leaf" develop typical crinkling. The F1 between them behaves like the Upland parent, growing normally in the greenhouse in the hot weather and becoming crinkled when the humidity rises in June. Fully developed leaves do not change their character with changing environment, so crinkling must be the result of abnormal growth. The main morphological cause of crinkling appears to be that growth at right angles to the main veins does not keep pace with growth in length. Since growth in length is radial from the leaf base, this results in curling of the leaf as a whole, as well as puckering of lamina between veinlets.

(iv) The work of interspecific hybridization with *G. anomalum* recorded under "Cytology" in the last report has developed chiefly on the genetic side. The second back crosses were very successful, combining great vigour, and a desirable plant habit, with lint of reasonable length and fineness and a fair ginning percentage. Considering the facts that (1) the F1 was highly sterile, (2) the *G. anomalum* parent had no spinnable lint, and (3) the Asiatic type used in the first cross was of very inferior quality, the results considerably exceeded expectation. The behaviour of selfed progenies of the best plants in the current season should provide much-needed information on the number of back-crosses required in an inter-specific cross to re-establish genetic balance. The work is handicapped in some directions by the difficulty of germinating seed of the F1's and by the failure to grow *G. anomalum* at Indore.

(v) From the study of genetic variance in parents, F1's and F2's of all possible crosses between three strains of *G. arboreum* var. *neglectum* data of great interest are now available. The preliminary stages of the analysis have demonstrated the existence of hybrid vigour even in intervarietal crosses, and the existence of genetic variance in strains which have been selfed for as much as seven generations. The replicated progeny-row technique developed last year has made possible the elimination of a number of disturbing factors which would have vitiated the experiment if laid out on any of the systems in common use for such purposes.

(d) *Selection, Breeding and Seed Distribution—Malwa Tract*—Plant breeding work has been closely linked with the study of genetic variance referred to above. The principle of basing selection on variance as well as mean value has proved its worth, and the advantage of the replicated progeny-row technique over current plant breeding methods becomes greater as time goes on. Abundant information is now available for compiling papers on the replicated progeny-row technique, and on the results so far achieved from it.

(i) The first achievement of the new technique has been the isolation of five sub-strains from Malvi 9 which differ considerably in their morphological characters. Two of the sub strains surpass both Malvi 1 and Malvi 9, considerably in earliness. Spinning

* Unirrigated and unmanured

tests on them and on Malvi 9 bulk show marked differences between them. They were valued as follows for the following highest standard warp counts:

Strain	II S. W. G.
Malvi-bulk	16's
Malvi 13	20's
Malvi 13	15's
Malvi 17	22's
Malvi 19	13's
Malvi 20	21's

The isolation of sub-strains up to 37 per cent. better in spinning value from a strain which according to any current plant breeding standard would have been considered pure, must be regarded as a considerable achievement. The three sub-strains, Malvi 17 Malvi 19 and Malvi 20 sprang from sister plants in the 1912-33 crop and the isolation of sister plants whose progenies differed by as much as 70 per cent. in spinning value is a remarkable demonstration of the potentialities of improvement in spinning value. If methods of estimating it can be found which will meet the demands of the plant breeder.

(ii) A mill test on a full bale of Malvi 9 bulk was arranged by the Director of the Technological Laboratory Matunga, and carried out by the Bombay Dyeing and Manufacturing Co., Ltd. In nominal 20's counts it gave a test of 63 lbs., and the cotton was valued at Rs. 40 on Broach.

Trade opinion is unanimous that Malvi 9 represents a great advance in quality over the Malvi crop at present grown. Technological Laboratory tests show that its spinning value is about 60 per cent. better than the local mixture grown on the same land, at Indore and about 100 per cent. better than the local seed component of the mixture grown under the same conditions. Every effort is being made to organize its multiplication in solid blocks in order that the trade may be in a position to obtain pure lots of it at the earliest possible moment, and therefore to pay a proper premium for its quality. Nevertheless, experience with Malwa Upland has led to the conclusion that even with very large improvements in quality the maximum premium obtainable is about 15 per cent. and the main emphasis therefore remains on increased yield rather than on increased quality.

(iii) The demand for seed of Malvi 9 has been so great that it has not been possible to meet even some of the more important incidents. Eighty-one maunds of seed of Malvi 9 and 155 maunds of seed of other Malvi strains have been distributed for the current season. With a view primarily to study the difficulties and costs involved in a cotton seed distribution project and secondly to provide a seed supply more nearly adequate to the demand, five villages in the vicinity of the Institute have been provided with Malvi 9 seed for their best lands and Malvi 1 seed for the whole of the rest of their cotton area. It is intended next season to fill up the whole cotton area in these villages with Malvi 9 from seed from their Malvi 9 crops of this year and thereafter to use them as a nucleus block for seed supply on a larger scale than is at present possible.

(iv) The examination of the new Malvi selections has shown that few of them attain the lint quality of Malvi 9 but most of them are somewhat superior to Malvi 9 in wilt resistance. In view of the likelihood that their genetic variance will be greater than that of Malvi 9 the best of them have been retained for further test, and intensive selection. The demonstration of differences between Malvi 17 progenies in wilt resistance has also led to selection for it within Malvi 9. The comparison of the rates of improvement under selection in strains fresh from the field and strains line bred for nine generations is expected to provide interesting and valuable information.

(v) The Dhar mass-selected Malvi strain and the first seven progenies selected from it have already been tested against Malvi 9 in a full size experiment. Yield was as high as Malvi 9 but staple length and ginning per cent. were somewhat lower. This first batch has, therefore, been discarded in favour of the next batch coming for test, some of which have considerably better lint properties. Among them, also, are strains with greater monopodial development than is usual in Malvi cotton. On theoretical grounds it is considered that such a habit may be of value in delaying flowering until after the risk of

late rains, and then getting flowering over in a sufficiently short period to ensure the ripening of the crop before the danger of damage from frost. The prediction will be checked by flowering and cropping records in the current season.

The Dhar Malvi material will be grown in parallel cultures at Indore and Dhar in the current season, and comparison will be made between the genetic variances of new selections from the field, mass-selected material from Dhar and line selected Malvi 9. The fundamental importance to plant breeders of information concerning the effect of selection on genetic variance is obvious.

(vi) The transfer of work on Malwa Upland (American) to Badnawar (Dhar State), referred to in last year's report has already resulted in substantial progress. A strain giving considerably higher yield than the bulk has been isolated, and further promising early strains and high quality types are being tested in the current season.

(vii) From the Nimar selections the first batch has now been taken for full scale test. The good quality types are all of the "yellow-flowered, broad-leaf" constitution which has a much higher survival value than Verum types in the Central India section of the Nerbudda valley. One Roseum type has been retained on account of its wilt resistance. A number of selections are now available with satisfactory staple length and "feel". Ginning percentage, however, is usually not more than 30. As studies of the effect of selection on commercially valuable characters in cotton have shown that ginning percentage responds more rapidly to selection than any other character, and as correlation studies in the Nimar material show that considerable improvement has already been effected, there is every reason to believe that a satisfactory value can be attained without going outside the material now in hand.

(viii) The out-station cotton breeding work at Dhar, and Badnawar, and in Nimar is carried out at three separate centres each about 50 miles from Indore with the co-operation of the Superintendent of Agriculture and two Agricultural Overseers of Dhar State, and of a progressive ginowner. The improvement achieved in two seasons is a convincing demonstration of the practicability of conducting plant breeding work on modern lines at district centres where only limited assistance is available, and laboratory facilities do not exist.

(e) *Variety Trials*—Cawnpore 520 and Mollison were compared in randomised block trials in 1935 at the State Farm at Sriganaganagar and in cultivators' fields both in the light soil and on the stronger Ghaggar bed soils at six centres in the Gang Canal Colony (Bikaner State). Yields were poor. Cawnpore 520 did not differ significantly from Mollison except in the light soil where the latter yielded significantly better. Cawnpore 520 obtained a premium of about eight annas per maund of *lapas* over Mollison at all centres. At the State Farm eight *desi* strains from Lyallpur were compared with Cawnpore 520 and Mollison. All these strains are of poor quality like Mollison and out of them only two, Roseum 10 and Mollison 74, have been retained for further trial on account of their good yield and high ginning percentage.

In Jaipur State trials were carried out at three centres. Due to late sowing yields were poor. Cawnpore 520 on the whole did better than the other varieties tried.

In the black soil area of Jodhpur State trials were conducted at three centres. This is the only tract so far studied where an Upland variety appears to be more profitable than *desi* types. On the basis of results obtained so far, a trial distribution of Indore 1, a selection from Malwa Upland, has been recommended.

The only trial in the black soil area of Bundi State suffered from late sowing and all varieties except Indore 1 gave a significantly lower yield than local.

The most important trials in Malwa were those carried out at four centres for comparison of Malvi 9, Dhar Cambodia and local on *adhan** land. It is now safe to conclude that Malvi 9 is as profitable as Upland cotton under conditions most favourable for the

* Irrigated and manured for many years

latter while Malvi 9 is more profitable under all other conditions. At Chhabra in Tonk State Malvi 9 yielded as well as the local cotton and had a better staple and a considerably better ginning percentage.

In similar replicated trials were carried out at Khargone, Sindhwa, Kannon and Kankali while single plots were laid out at three centres in Barwan State. N. R. 6 was the best yielder and the best ginner among the varietal trial but is of a very poor quality and cannot be recommended. Verum 434 is a promising strain. It is of superior quality yielded as well as the local and gave a slightly higher ginning outturn. Further trials with Verum 434, Barilla and Malvi 9 are necessary.

(f) *Physiology*.—(i) A botanical analysis of the published data on spinning quality and hair characters has been made and the findings are being put together for publication. Various possible methods of improving the efficiency of estimation of the small differences in spinning value of importance to the plant breeder have been explored, but so far with out much success. The discrepancy between the hair properties and spinning values of Malvi 1 and Malvi 9 remains unaccounted for.

(ii) Arising out of the cotton census, physiological experiments were carried out in the hope of discovering the main factors responsible for the observed differences in survival value of the four simple growth types. Monthly changes in leaf area and dry weight were determined and it was shown that while leaf shape affects very greatly the area of the individual leaf, the total leaf area per plant was the same in both leaf-shape leaves. Broad-leaved, yellow-flowered, and narrow-leaved, white-flowered classes, however had considerably and significantly greater leaf areas per plant than narrow leaved, yellow-flowered and broad-leaved, white-flowered classes. The classes with the greater leaf area are those which were found to have the higher survival value. Differences in dry weight were suggestive but not conclusive. Further work is in progress.

(j) Experiments on the effect of competition on the relative survival value of desi and American cottons in Malwa revealed the fact that their behaviour in pure culture is no guide to their behaviour in a mixed crop. Data have been collected on differences in germination, post-germination mortality, and cropping power under different conditions of competition, and the reasons for the survival of Upland in Malwa are becoming much clearer in consequence.

9 *Cotton—Physiology Pathology and Agronomy* (a) *Leaf-roll and Red-leaf of American Cottons* (i) *Occurrence and influence on yield*.—This malady is the chief obstacle to successful growth of American cottons on the black cotton soils of Malwa. Better results are obtained on the open-textured and highly manured alluvial soils of this tract and on the manured and irrigated soils of Rajputana. The disease, however, appears even there under certain conditions and affects yields. On the irrigated arid soils of the Gang Canal Colony the disease may appear during October while the crop is maturing, but does not seem to affect the yield, as indicated by the observations in the year 1934-35 given below.

TABLE 1.—Yield Differences in Healthy and Diseased Plants—1934-35.

Variety: P.289F; at Siriganaganar Bikaner State. Mean yield of kapas (seed cotton) in grammes per plant from 30 random pairs.

CONDITION	First picking	Second picking	Third picking
Healthy	77 67	261 00	323 33
Diseased	411 33	209 67	97 67

	P	Sig. differences.
Health and disease	> 0 05	
Pickings	< 0 05	5 23
Interaction: Health disease x pickings	< 0 01	6 63

Total yield of *kapas* was not affected. Most of the yield of diseased plants was obtained in the first picking, falling in the proportion of 4:2:1 at each picking, while the yields of the second and third pickings of healthy plants were nearly five times that of the first picking. The first picking of diseased plants and the second picking of healthy ones yielded equally. This shows a premature ripening of the diseased plants due to a check in normal development—confirmed by the observed partial bursting of bolls. This may be the cause of reduced quality in a diseased crop with normal yield. A Cambodia crop affected by red-leaf on black soil at Dhar, Malwa, during 1934-35, gave a lint length of about 19 millimetres only.

(v) *Chemical Differences in the Composition of Mature Leaves of the Healthy and Diseased Plants*—The pH values of the water-extracted sap of the healthy, green Cambodia leaves were significantly higher than those of both the green and red portions of the diseased leaf. There was no difference between the sap of green and red portions of the same leaf.

TABLE 2—*pH Values of the Sap of Healthy and Diseased Leaves of Cambodia Cotton at Indore*

COMPARISON BETWEEN	Mean pH		n	t	P
	Healthy	Diseased			
1. Healthy green (whole leaves) and rolled green portions of leaves	5.82	5.69	12	2.34	<0.05
2. Healthy green (whole leaves) and red portions of leaves	5.82	5.61	12	3.53	<0.01
3. Green and red portions of rolled leaves	5.69	5.61	14	2.06	>0.05

The concentration of the sap—as indicated by osmotic pressure measurements—of healthy leaves was higher than that of unhealthy ones.

TABLE 3—*Mean Osmotic Pressures (Atmospheres) of leaf-sap of Healthy and Diseased (leaf roll) Cambodia cotton plants*

Healthy	Diseased	n	t	P
6.7	5.2	120	6.87	<0.01

These observations indicated that the sap of diseased leaves was poorer in soluble matter—apparently in basic materials. This was borne out by actual analysis of samples of healthy and diseased mature leaves collected at Indore and Japur, boiled immediately and preserved in 90 per cent alcohol. The outstanding differences in the composition are given below—

TABLE 4—*Composition of Healthy and Diseased mature leaves of Cambodia On Oven-dry Basis*

DESCRIPTION	Mean per cent		P	Significant difference
	Healthy	Diseased		
Nitrogen	1.71	1.21	<0.05	0.39
K ₂ O+MgO/P ₂ O ₅	4.83	3.99	<0.05	0.73

(iv) *Root density*.—Three *Platanus* indicated the ability of the diseased plant to maintain 1 cm² root area. A comparison of the productivity of root areas pairs of healthy and diseased plants revealed that the root density was —

TABLE 5.—*Root Density in Productivity of Healthy and Diseased Cordobas Caring Plants at Indore.*

	Root density	Root area length in feet		n	t	P
		Healthy	Diseased			
Active roots	18" diameter	47.2	8.1	25	3.67	<0.01
Dead roots	0.18"	4.8	12.7	25	3.18	<0.01

The active root length of diseased plants to 18" root diameter was significantly less and the length of dead roots was significantly greater in the upper part for the diseased plants in the first year. It appears that the active root length in the upper zone reflects the activity of the root in the lower zone in diseased plants.

(vi) *Root Condition*.—The amount of soil water from zones around healthy and diseased plants at root tip of Cordobas caring plants was —

TABLE 6.—*Moisture Content (Atmosphere) of Soil water from Zones around Healthy and Diseased Cordobas Caring Plants.*

Description	Healthy	Diseased	n	t	P
1. Upper zone 0'-3"	3.25	13.37	10	4.94	<0.01
2. Lower zone 12'-15'	10.37	17.32	10	3.43	<0.01
3. Percentage drop from lower to upper zone	62.95	22.31	10	3.24	<0.01

Osmotic pressures of soil water were less around roots of healthy plants than diseased ones at any rate down to a depth of fifteen inches, but the percentage fall in osmotic pressure from lower to upper layers was greater around the roots of healthy plants than diseased ones. This is taken to indicate accumulation of solutes due to poorer mobility in the soil around the roots of diseased plants.

(b) *WILTS*.—(i) *Periodicity*.—Observations taken during the years 1933-34 and 1934-35 on the periodic fluctuations in virulence of cotton wilt (*Fusarium* sp.) have now been examined. Percentage deaths calculated on initial stand for each period are given, with their statistical evaluations in Table 7. Numbers significantly higher than both the preceding and following ones are marked with a double dagger (‡) and those significantly higher than an adjacent number with a single dagger (†) pointing one way.

TABLE 7.—*Periodic Fluctuations in Wilting.*

Percentage of deaths on initial stand at the beginning of each period.

A Malva

PERIODS	F No 19 1933-34	F No 11B 1933-34	F No 19 1934-35	F No 11C. 1934-35	F No 11B Seed from diseased plants 1934-35	F No 11B Seed from healthy plants 1934-35
1st	0	7 8	10 6	13 7	0	0 4
2nd	4 1	5 0	†21 0	†25 1	21 3	15 3†
3rd	9 2	†17 5	†27 7	10 2	16 3	14 3
4th	7 6	4 6	†45 0	7 3	26 1	27 3†
5th	1 0	†15 6	14 9	7 8	26 5	18 6†
6th	6 9	†8 5	16 1	11 7	5 3	7 5
7th	0	1 9	19 1		21 5	25 2†
8th	5 1	2 7			9 2	5 0
9th	3 7	0			19 7	10 3
10th	2 3	0			5 5	8 4
11th	3 3	†6 9			5 3	5 2
12th	1 5	†11 2				
13th		†27 0				
P	> 0 05	< 0 01	< 0 01	< 0 01	> 0 05	< 0 05
Sig Diff		3 5	6 4	6 4		9 1

B Verum.

PERIODS	F No 19 1933-34	F No 11B 1933-34	F No 19 1934-35	F No 11C 1934-35	F No 11B 1934-35
1st	0	1 3	7 3	12 2	0 4
2nd	0 8	3 9	9 1	†21 8	8 1
3rd	2 5	8 1	†18 1	†5 8	6 3
4th	0	5 2	†14 0	0 6	†16 3
5th	3 2†	0	†7 5	1 7	9 3
6th	1 0	0 7	0 5	4 2	2 1
7th	0	0	2 0		5 0
8th	0	3 8	†10 7		1.8
9th	0	0			3 7
10th	1 0	0			1.3
11th	0	0			2 0
12th	4 4†	0			
13th		2 9			
P	< 0 05	> 0 05	< 0 01	< 0 01	< 0 01
Sig Diff	2 7		3 8	4 3	6 6

C. *Recessa.*

Persons.	F No. 19 1933-34	F No. 11B. 1933-34	F No. 19 1934-35	F No. 11C. 1934-35.
1st	0	9 8	†10 9	10 9
2nd	5 6	17 7	5 7	†11 3
3rd	2 4	17 5	†19 5	†5 1
4th	2 0	7 6	†18 5	0 5
5th	0	18 8	2 4	3 7
6th	0	13 0	†7 5	3 6
7th	0	0 9	5 3	
8th	1 3	2 6	8 1	
9th	1 3	0		
10th	0	2 2		
11th	0	0		
12th	0	5 4		
13th		0		
P	> 0 03	< 0 01	< 0 01	< 0 01
Sig. Diff.		12 5	4 6	3 4

D. *Dhonor 2.*

Persons.	F No. 19 1933-34.	F No. 11B 1933-34	F No. 19 1934-35.	F No. 11C. 1934-35.
1st	0	5 6	†10 0	4 1
2nd	1 7	9 2	4 7	3 6
3rd	2 4	†13 5	†15 2	2 9
4th	1 6	4 3	†16 9	0 8
5th	3 3	7 1	5 4	0 4
6th	0	3 2	5 8	1 1
7th	0	2 4	2 9	
8th	0 4	1 0	3 8	
9th	0 8	1 0		
10th	0	1 1		
11th		0		
12th		0		
13th		1 3		
P	> 0 05	< 0 05	< 0 01	< 0 05
Sig. Diff.		7 5	4 1	2 5

E Dharwar I

PERIODS	F No 19. 1933-34	F No 11B 1933-34	F No. 19 1934-35	F No 11C 1934-35
1st	0	10 8	11 6	7 1
2nd	†9 1	15 8	10 3	†11 8
3rd	11 3	†18 6	†21 6	2 1
4th	5 0	6 6	†23 6	1 9
5th	0 6	4 6	8 7	0 6
6th	0 2	5 1	7 2	0 3
7th	0	7 0	6 3	..
8th	0 6	1 5	7 1	
9th	2 3	0		
10th	0 6	3 0		.
11th	0	0		..
12th	0 2	1 3		..
13th		0 7		..
P	<0 01	<0 01	<0 01	<0 01
Sig Diff	6 8	7 5	6 1	4 1

It may be noted that (1) periodic fluctuations in death rate may not vary significantly throughout the season, (2) death rate may gradually fall to a significantly lower level as time advances, or (3) the death rate may reach, once or oftener, a significantly higher level than that of either or both the preceding or succeeding periods in different fields or seasons. Different varieties may not always behave similarly under the same conditions. A gradual fall without peak was shown only by Dharwar 2 and Roseum. Dharwar 1 did not show more than one peak. Both resistant and susceptible varieties showed these environmental influences.

Irrespective of season and field Dharwar 1 showed a greater susceptibility than Dharwar 2, but there was no such difference between Verum and Roseum.

TABLE 8—*Mean percentage deaths, due to wilt, of resistant and susceptible varieties grown at Indore, irrespective of field and season*

	Resistant	Susceptible	Resistant	Susceptible.
	Verum	Roseum	Dharwar 2	Dharwar 1
Mean % deaths	4 8	6 1	3 7	6 1
	P > 0 05		P < 0 01, Sig Diff 1 8	

Thus it appears that a variety which is commonly classed as "resistant" may be so only under certain environmental conditions. When those conditions are changed it may become susceptible, while under those identical changed conditions the "susceptible" variety may become resistant. The average mortality from wilt at the end of the season at Indore was found to be 63.4 per cent for Malvi, 52.7 per cent for Roseum, 50.4 per cent for Verum, 31.1 per cent for Dharwar 1 and 20.6 per cent for Dharwar 2.

(ii) *Temperature humidity and light*.—Most of the deaths occur within the period when the soil temperature at 6 inches depth was between 25°C and 22°C and at 15 inches between 25°C and 21°C. The temperatures fell later as also the death rate. This agrees well with Kulkarni's observations in general.*

Within this period a sudden rise in death percentage seems to coincide with the sudden rise in mean duration of sunlight at the end of the monsoon, which rose from two hours to five hours daily.

In the later period, when the soil temperatures were low duration of sunlight made no difference.

(iii) *Nutrition and soil texture*.—*Pot cultures*.—In one series of pot cultures in 1934 the soil was mixed with heated soil (at the rate of 60 cartloads per acre/two inches) ferrous sulphate (at the rate of 5 cwt. per acre/two inches) and slaked lime (at the rate of one maund per acre/two inches) in order to change its physical condition. Ammonium sulphate and Nidfoe 23/18 grade, (at the rate of 2 cwt. per acre/two inches), farm compost and municipal compost (at the rate of 20 cartloads per acre/two inches) were mixed with each of these. Malvi cotton was sown after infection, which was maintained at the same level throughout the experiment. The results are given in Table 9.

TABLE 9.—*Physical treatments manuring of soil and wilt-incidence in pot cultures.*
Mean death percentage.

MANURES.	Physical Treatments.		
	Ferrous Sulphate.	Fire-heated Soil.	Slaked Lime.
Nidfos	28.6	11.1	21.1
Ammonium sulphate	26.9	47.8	29.2
Farm compost	23.6	16.7	0
Municipal compost	6.7	25.0	8.3

	P	Sig. Diff.
Physical treatments	> 0.05	—
Manures†	< 0.05	16.2
Interaction (physical treatments x manures)	> 0.05	—

†Ammonium sulphate	Nidfos 23/18	Farm compost.	Municipal compost.
24.6	20.3	12.4	15.3

Nitrogenous treatments increased incidence as reported before (1935), in spite of textural treatments. It is to be noted that the presence of phosphorous (Nidfoe) had slightly modified the influence of nitrogen.

(iv) *Nutrition and soil texture*.—*Field tests*.—The uniform intensity of treatment in pot cultures is absent in the field where in addition, interaction of the subsoil plays its part. How far the results of the pot culture are borne out in the field was tested in 1934. A wilt-affected portion of a field was selected and the same physical and manurial treatments were given as in pot cultures, and at the same rates. Malvi seed from healthy and diseased plants of the previous season, and Verum seed from healthy plants was sown. The soil was infected. The data, being voluminous are not given, but the following table of significance will indicate the influences of the several factors.

TABLE 10.—*Significance*

	VERUM.		MALVI		MALVI, DISEASED SEED.	
	P	Sig Diff	P	Sig Diff	P	Sig. Diff
Periods .	<0 05	2 95	<0 05	4 28	<0 05	6 50
Manures	<0 05	1 07	<0 05	1 39	<0 05	1 73
Manures X physical treatments	<0 05	3 32	>0 05		<0 05	4 67
Manures X periods	<0 05	3 20	<0 05	4 2	<0 05	5 12
Manures X physical treatments X periods	<0 05	8 75	<0 05	11 64	<0 05	13 96
Physical treatments	>0 05		>0 05		>0 05	
Physical treatments X periods	>0 05		>0 05		>0 05	

For all varieties, irrespective of treatments, there was a significant rise in the incidence at the second, third and fifth periods. In Malvi plants, both from healthy and diseased seed, municipal compost showed a significantly higher incidence than control and Nicofos. Ammonium sulphate was superior to Nicofos. With Verum, however, ammonium sulphate and farm compost showed the highest incidence, there being no significant differences between farm and municipal compost. The physical treatments in general made no difference, but influenced the behaviour of manures with Verum and Malvi from diseased seed. For all varieties, however, manures influenced the periodic fluctuations and the physical dressing modified that influence.

It is thus clear that under field conditions application of the same manures may give varying results, due to their interaction with the soil conditions and variety grown. Manual experiments for wilt control have given inconclusive results in the past and will do so in future, unless such experiments are based (1) upon a definite knowledge of the interaction of soil and manure for the locality, and (2) upon equally definite information as to whether the interaction adequately satisfies the intrinsic requirements of the variety grown, estimated independently.

(v) *Leaf Composition in wilted and healthy plants*—Mature leaves of the resistant Verum and susceptible Malvi plants—healthy and on the point of wilting—were collected, boiled in 85 per cent alcohol and analysed.

The accuracy of this sampling was ascertained by the examination, for the presence of *fusarium*, of thirty plants about to wilt. Transverse sections of (1) the tap root, four inches below the soil surface, (2) the hypocotyl and (3) the second internode of the stem, invariably showed fungus hyphae in the vascular bundles. All samples, except three, gave growths of fungus identified as *fusarium* species, after incubation on cotton wool soaked in Richard's solution.

A few significant differences in composition are tabulated below—

TABLE II.—Composition of mature leaves of healthy and wilted plants

Mean figures taken on seven dry leaves.

Description	Varieties and Conditions						Experiments			
	Mali		Yarni		Yarni		Condition		Varieties and Conditions	
	Healthy	Wilted	Healthy	Wilted	F	Per cent	F	Per cent	F	Per cent
Straw	2.56	1.97	2.26	1.91	22.00	8.37	2.77	0.17	2.04	
Phosphorus (P ₂ O ₅)	0.75	0.71	0.94	0.98	27.15	8.37	2.00		2.00	
Potash (K ₂ O)	1.25	0.71	0.91	0.91	20.00		2.00	0.00	2.01	0.03
Water										
Straw	0.06	0.00	0.00	0.04	2.00		2.00		0.00	0.71
Phosphorus (P ₂ O ₅)	1.20	0.71	0.94	0.94	2.00		2.00		0.00	0.00
Potash (K ₂ O)	1.21	0.71	0.94	0.94	2.00		2.00	0.00	2.00	0.00
Straw	1.24	0.00	0.00	0.00	2.00		2.00	0.00	2.00	0.00
Water										
F	1.01	0.00	0.00	0.00	2.00		2.00		2.00	0.00
Phosphorus (P ₂ O ₅)										
K ₂ O	1.00	1.71	0.91	0.00	2.00		2.00	0.71	2.00	0.71

The higher phosphorus content of the standard variety Yarni than that of the susceptible Mali is noteworthy. The leaves of wilted plants of both varieties showed a deficiency of nitrogen. Finally, the susceptible variety Mali showed a lower content of phosphorus when diseased. The ratio of phosphorus to nitrogen, probably of less value also here. The healthy leaves of both the susceptible and standard varieties had a lower ratio of lime content to that of potash, while the wilted leaves of the susceptible variety Mali contained a far greater proportion of phosphorus and lime with respect to their nitrogen and phosphorus content.

(1) Nutrition for various commercial grades (2) "Kiln-dried" leaves and materials used in the—These years' experiments have clearly shown that the nutrition of the cotton plant is not dependent only on the kind and quantity of nutrients added to its soil, but on everything else being the same the condition of the soil medium around the developing root and to what extent the nutrients might affect the growing plant. For instance, the results of the pot culture reported in 1923 where the normal surface soil of India was used, a root that the application of nitrogen and phosphorus together increased yield of Mali 10 and Centuria Indica 10 times by nearly five-and-a-half and four-and-a-half times respectively. But in presence of copper the order of these increases was reversed and when the soil was flocculated by acid the increase was only two-and-a-half times and twice respectively. The addition of copper to soils thus flocculated had no further influence on yield. With other nutrients the effect was even reverse when the physical condition of the soil was modified by treatment with copper or acid. In the Centuria Indica gave a yield increase of forty per cent. In Mali cotton on a well drained soil free from surface wash at Indore but no such difference was found at Dhar. Mali in a field liable to severe run-off. The Centuria crop at Dhar actually yielded less with Nitro.

It became evident that pot culture studies would be more applicable to field practice if they included consideration of the possible influences on plant nutrition of the varying conditions existing between fields in the same soil type. The investigation in replicated pot-culture of the effect of differences in field soils was first taken up in 1923-24. Soils were collected from the first and second horizons in the profile of the rich field No. 42, the medium field No. 31 and the poor field No. 29 on the Institute farm. Field No. 42 is scarcely ever affected by surface wash, No. 31 only occasionally but No. 29 is always subject to it. Each horizon was nine inches thick for the rich and poor fields and six

inches for the medium one. The manural treatments were compost alone, Nicifos 22-18 (N P=1 1) each at a rate equivalent to 200 milligrammes of nitrogen per kilo, of the soils and both these manures together. Malvi 9 and Cambodia Indore 1 were the varieties grown, and there were four replications of a complex design. After germination the plants were thinned to four per pot, two of which were removed 41 days after sowing for the determination of fresh and dry weights. The other two were retained for subsequent observations on development and yield. The plants were grown only on rains. The total yield results are given below with their statistical evaluations.

TABLE 12 —“Soil-varieties,” manures and cotton varieties

Total yields of *kapas* per plant

A. Pot cultures—gms per plant

VARIETY OF COTTON	Soil “Variety”	Horizon	No Manure	Compost	Nicifos 22/18	Compost and Nicifos 22/18
Cambodia—	Rich	1	2 7	17 3	13 2	8 3
		2	3 3	7 4	4 8	7 4
Indore 1	Medium	1	7 1	5 8	6 5	5 6
		2	5 5	24 1	8 8	76 0
	Poor	1	2 6	5 6	14 1	14 2
		2	4 9	10 5	11 9	14 5
Malvi 9	Rich	1	0 0	3 1	4 5	3 0
		2	0 8	5 2	13 5	3 3
	Medium	1	6 4	18 4	12 9	7 9
		2	4 4	4 4	19 6	32 7
	Poor	1	0 0	7 0	18 6	37 9
		2	0 6	16 7	8 4	31 3

Significances	P.	Sig	Diff
Soil "varieties"	<0 05	5	8
With or without compost	<0 01	7	8
With or without Nicifos 22/18	<0 01	7	8
Soil "varieties" × horizons	<0 05	8	3
Soil "varieties" × horizons × with or without Nicifos 22/18	{ Nearly sig on 5% Z value 0 5723, required 0 5951 }		14 2

All other differences are non-significant.

B.

Compost	No Compost
15 3	7 3

C.

HORIZON	Soil "variety "		
	Rich.	Medium.	Poor
1	6 5	8 9	12 5
2	5 7	22 0	12 4

D

HORIZON	Nielfos 22/18.			No Nielfos.		
	Soil "variety "					
	Rich.	Medium.	Poor	Rich.	Medium.	Poor
1	7 2	8 3	21 2	5 8	9 5	3 8
2	7 3	34 3	15 6	4 2	9 7	8 2

Compost has all along raised yields. Though the average yield of Nielfos-treated plants was significantly higher than that of the rest, the response to it for different soil varieties" and their horizons appeared to be different if their interaction, which is almost significant, is considered. The second horizon of the medium soil and the first of the poor one responded significantly to the manure. The yield from the second horizon of the medium soil was significantly higher than all others, manured or unmanured, except that from the first horizon of the poor soil which was superior to both unmanured horizons of the rich soil. Without manure there was no difference in the yields from the different soils. The absence of response to manures in both horizons of the rich soil, the top zone of the medium and the lower zone of the poor one is remarkable and requires further investigation. At any rate these results partly explain why those of pot-cultures in 1934 were not always reproduced in the field. The consistent superiority of compost found when applied to different soils and horizons in this test has so far failed to appear in the field. Perhaps this may be due to the difference in the depth of application. Similar superiority was noted last year for a small field plot when the manure was applied deeper. The greater evaporation in pots kept above ground than in the field, as well as the absence of run-off leading to saturation and mechanical packing of the surface soil occurring in the field, are also possible factors. The 1936 test where the manures are to be applied only to the top three-inch layer may perhaps give a further clue.

The Cambodia plants retained their stand in all the pots but that of Malvi was reduced due to casualties by wilting. A statistical examination brought out some interesting results which are given below —

TABLE 13 — *Stand for Malvi cotton*

Mean of 4 pots.

TREATMENT	Soil "variety"		
	Rich	Medium	Poor
No manure	0 7	1 5	0 2
Compost	1 2	1 0	2 0
Nicifos 22/18	1 5	1 2	1 5
Compost and Nicifos 22/18	0 7	1 5	1 7

Almost significant, $Z=0.5808$

Z required = 0.5951 Sig. diff. = 0.74

The unmanured rich and poor soils showed most casualties. Both compost and Nicifos 22/18, alone or together, reduced them on the poor soil. On the rich soil, however, the two manures together or compost alone had no effect. Nicifos 22/18 significantly reduced wilt. On the medium soil there was no significant difference but numerically both the manures used singly seem to have slightly reduced the stand. These results seem to corroborate to some extent the findings in field observations on cotton wilting.

The differences observed in stand due to treatment in pots suggested an examination of yields on the basis of all standing plants in each pot, similar to the estimation of plot yield in a field. It was hoped thus to get an indication how far this factor could account for the differences observed between the results of pot and field tests. The result of the examination showed that Cambodia responded to compost best on medium, and Malvi on poor soil and that soil of the second horizon of the medium field appeared to be the best for Cambodia, while that of the first horizon of the poor one was so for Malvi.

These results are similar to those reported last year. It must be remembered that the plants fed themselves throughout their lives in the same "variety" of soil in these pot cultures, while in the field they do so in the first and second horizons depending upon their thickness, moisture content and the stage of growth of the plants. It appeared that the field behaviour of the plants could be better estimated by imitating in pot-cultures these conditions, using in the same pot known thicknesses of two horizons under test, one above the other. This is being done in the current year.

(11) "Soil variety," *humus and nutrients—field crops*—The favourable influence of nitrogen and phosphate on the yield of Cambodia cotton observed in pot cultures in 1934-35 could not, as reported before, be obtained in the field either at Dhar (Malwa) or Jaipur in experiments of the same year. The superiority of cake manuring in the Jaipur test, especially for the April sown crop, suggested the possibility of securing under field conditions the high yields that were obtained in pots, by the use of nitrogen and phosphate in an organic form. An extensive "feeler" test was carried out in 1935-36 in order to ascertain whether there existed in Malwa or Rajputana any possibility of maintaining an

adequate supply of organic nitrogen and phosphate in local soils while the Cambodia cotton was growing, so that reasonably high yields could be obtained as a rule. Two randomised blocks per field were designed for the following places—

(a) *In Rajputana—*

- (1) in Jodhpur and Khetri, two fields each,
- (2) in Alwar Jalpur and Bundl, one field each,

(b) *In Malwa—*

- (1) in Dhar and Jaora one field each,
- (2) in Indore two fields.

The treatments were: well rotted sheep or cattle dung manure applied at 20 cartloads per acre at sowing, with or without a supplementary dressing at the same rate six weeks after sowing. The crop was to be irrigated at each place as required. A variety of crops preceded the cotton crop at different centres and equally varied were the local methods of cultivation. Sowings were done in Rajputana between the 3rd and 13th July and at Indore on 23th June. The results given below are based upon the data obtained from those places where the experiments could be properly carried out.

TABLE 14.—*Yields of rain-sown Cambodia Cotton with Sheep or Cattle-dung manure.*

Total yields of *Lapas* in lbs. per acre

BASAL DRESSING	Top Dressing	Jodhpur		Jalpur	Bundl	Alwar	Khetri, Mirapur	Indore, I P I.
		Ball	Mandore					
Cow-dung	None	1 467	1 195	919	677	465	554	308
	Cow-dung	1 488	1,312	966	701	605	445	357
Sheep-dung	None	1,558	1,236	959	674	765	533	330
	Sheep-dung	1 406	1,61	1 140	711	511	406	365

Significances:

P

Sig. diff.

Places
Basal dressings:
Top dressings
All interactions:

<0 05
>0 05
>0 05
>0 05

274 4

PLACES.

Jodhpur Ball	Jodhpur Mandore.	Jalpur	Bundl.	Alwar	Khetri, Mirapur	Indore I P I.
1 480	1,251	1 003	691	504	481	315

The yields at Jodhpur and Jaipur were much higher than expected for a rain-sown crop, and reached the level of those from hot-weather-sown crops at the same places in previous years, while those at Bundi, Alwar and Khetri were at least equivalent to those usually obtained there with local cotton. These results seem to be significant and are being followed up. The variation of yield from region to region is interesting.

(d) *Nutrition in Relation to Environment—Quality*—Observations on staple-length of the pooled pickings of both Cambodia (Indore 1) and Malvi 9 from the pot culture test of last year have now been statistically examined. The results are tabulated below—

TABLE 15—*Soil Texture, Nutrition and Staple Length of Cotton*

(A) Mean Staple Length in mm

TREATMENTS	CAMBODIA—INDORE 1				MALVI 9			
	No treatment	Com-post	Acid	Com-post + acid	No treatment	Com-post	Acid	Com-post + acid
None	23.3	22.0	22.6	21.3	24.2	21.5	22.8	22.2
N	22.2	23.0	21.8	24.6	24.0	20.6	23.5	24.0
P	19.7	23.4	22.1	24.9	20.0	20.3	20.8	21.5
K	21.9	23.7	22.5	22.1	21.6	19.6	24.0	21.9
NP	17.6	21.5	21.1	22.6	21.0	20.8	23.5	21.5
NK	20.0	22.2	24.4	19.2	19.4	21.1	20.7	20.5

(B) SIGNIFICANCES

FACTORS	P	Sig diff	Interac- tion of first order	P	Sig diff	Interac- tion of higher order	P	Sig diff
a Varieties	<0.05		a > b	<0.01	0.76	d > c > a	<0.01	0.82
b Texture treatments	<0.01	0.53	{ c > a d > c	<0.05	0.52	{ d > c > b d > b > a	<0.01	1.16
c Presence or absence of nitrogen	<0.05	0.38	{ d > b d > a c > b	<0.01	0.79	d > c > b > a	<0.01	1.16
d Presence or absence of K or P	<0.01	0.39		<0.05	0.58		<0.01	1.58

According to treatments the mean staple length for Cambodia (Indore 1) varied between 24.9 and 17.5 mm, while that of Malvi 9 ranged between 24.5 and 19.4 mm.

It is interesting to note that Malvi 9 without any soil texture treatment gave the maximum staple length and that of Indore 1 under the same conditions was only slightly less than its own maximum. Further, the highest yielding treatments did not give maximum staple length for Malvi 9 but with Cambodia (Indore 1) one only of such treatments (compost + acid) produced a staple length not significantly different from its maximum.

It may be pointed out that the untreated pots were filled with the loose soil from the surface of fields and moisture supply was equal for all pots, treated and untreated through out the experimental period hence the lint lengths and yield obtained from untreated pots may be taken to represent the capacities of the loose surface soil alone from the fields, not modified by the influence of subsoil.

The probable influence of different soil horizons from fields of different fertility is at present under test. These results clearly indicate firstly that under conditions of equal moisture supply the influence of nutrition on lint-length is profoundly modified by differences in soil texture; secondly that the texture of surface soils of fields of normal fertility appears to be very nearly ideal for developing to their full length the staples of both *desi* (Malvi 9) and American (Indora 1) varieties under the conditions of soil moisture supply obtaining in the experiment.

The application of manures seems to disturb the equilibrium. The texture adjustments suitable for each manurial treatment and each variety may differ probably because of the disturbance in moisture-status of the soil due to the manured plants different needs for moisture and also to the changes in the capacity of the soil to handle the moisture supplied owing to the influence on its texture by the growing plant and the applied manure. It is well known that both these factors affect the chemical nature of and biological activities in the soil.

This, perhaps, explains why different workers came to different conclusions on this subject some ascribing greater importance to nitrogen phosphate or a combination of nitrogen and potash, while others emphasized the importance of moisture supply.

The results in field experiments reported last year also support this view.

(e) *Cotton nutrition in relation to environment plant development.* (f) *Legislative growth and ripeness—pot culture.*—In the pot-culture test discussed above total dry weights of the aerial portion of the seedlings 41 days old and those of the stems and leaves separately were determined. The bulky tables of the weights and their statistical evaluations are not given. For both varieties manuring created far greater differences than soil "varieties," in the dry weights for the whole shoot, leaf or stem. With Cambodia Nelfos was more effective than compost which suppressed the effect of Nelfos when used in combination. Compost increased the weights of leaves more than of stems but the effect of Nelfos was nearly the same. The ratios of minimum and maximum weights tended towards equality for both stems and leaves, as their weights increased by treatments. With Malvi 9 however compost and Nelfos did not differ very much in their effect on leaf weights whether used alone or together but Nelfos increased the stem weight considerably more than compost and the two together still more. This can be briefly illustrated by the comparison of ratios of maximum and minimum values given below:—

TABLE 16.—Ratios of minimum to maximum values of dry weights.

A. Cambodia Indora 1

RATIOS	No. Manure.	Compost.	Nelfos 22/18.	Compost and Nelfos 22/18.
Whole shoot	5	14	29	25
Stem	3	8	27	22
Leaf	5	13	29	27

B *Malvi* 9

RATIOS	No Manure	Compost	Nicifos 22/18	Compost and Nicifos 22/18
Whole shoot	5	15	18	22
Stem	6	25	34	42
Leaf	5	11	12	15

The maximum increases in plant weights for Cambodia were obtained on the soil from the first horizon of the medium field and those for *Malvi* from its second horizon

The ratios of the fresh weights of stems to leaves for each treatment were put to statistical examination. The results are given below —

TABLE 17 — *Ratios of fresh weights, stems leaves Indore 1935*

A

COTTON VARIETY	Soil "variety "	Horizon	No treat- ment	Compost	Nicifos 22/18	Compost and Nicifos 22/18
Cambodia Indore 1	Rich	1	0 33	0 39	0 59	0 52
		2	0 37	0 42	0 30	0 40
	Medium	1	0 32	0 47	0 58	0 46
		2	0 24	0 44	0 45	0 56
	Poor	1	0 36	0 30	0 33	0 43
		2	0 29	0 31	0 40	0 49
<i>Malvi</i> 9	Rich	1	0 31	0 99	0 31	0 76
		2	0 34	0 37	0 26	0 45
	Medium	1	0 18	0 46	0 38	0 63
		2	0 31	0 26	0 56	0 56
	Poor	1	0 27	0 23	0 21	0 51
		2	0 35	0 24	0 35	0 53

Significances

P

Sig diff

Compost and no compost

<0 01

0 07

B Nicifos 22/18 and no Nicifos

<0 01

0 07

Compost and no compost x cotton varieties

<0 05

0 08

C Compost and no compost x horizons x cotton varieties

<0 05

0 11

The differences due to other factors and interactions are non-significant.

B

Nicifos 22/18	No Nicifos
0 46	0 35

COTTON VARIETY	Horizon.	Compost.	No. Compost.
Cambodia Indore 1	1	0 43	0 42
	2	0 43	0 34
Malvi 9	1	0 59	0 28
	2	0 40	0 35

The ratios were significantly increased by Niclos 22/18 for both varieties, irrespective of treatments. With compost however the ratio of stems to leaves of Malvi 9 was significantly increased by compost only on the soil of the first horizons of all fields, but not on the second horizon. For Cambodia on both horizons the ratio did not increase irrespective of soil "variety". The effect of the horizons on the ratios was not appreciable except that the first horizons gave higher ratios for Malvi 9 than the second but only when compost treated.

(ii) *Vegetative growth and vigour—field crops.*—An attempt was made to ascertain the relation, if any, between growth and yield of cotton plants from bulk crops in the field in 1935. The free soil moisture around the plants at different depths and stages of growth was also estimated. The observations were taken on healthy vigorous-looking plants, chosen at random in both a rich and a poor field. Some of them have been examined and are discussed below:—

TABLE 18.—*Fresh Weights in grms. of Malvi Plants 1935.*

Growing Stage.

Stem weight.

Date	Rich field.	Poor field.	P	Significant difference.
16th to 29th August	11 8	6 4	<0 01	3 5

Leaf weight.

24th to 27th August	18 2	9 3	<0 05 }	3 8
27th to 29th August	21 7	13 0		

Flowering Stage.

Stem-weight.

Date.	Rich field.	Poor field.	P	Significant difference.
25th September to 12th October	55 6	33 8	<0 01	19 8

Leaf weight.

25th September to 12th October	45 8	33 9	<0 05	11 7
--------------------------------	------	------	-------	------

Up to the 12th of October the stem-weights of plants were higher in the rich than in the poor field. Afterwards the differences lost their significance. The leaf-weights in both fields showed no difference up to the 24th of August, thereafter they resembled those of the stem weights. The weights of flowers, buds and unopened bolls did not differ between the two fields at any stage up to December. The yields of *kapas* per plant, however, were higher in the rich field and were found to be highly and positively correlated with the ratios of stems to leaves at growing stage. The weights of flowers, buds and unopened bolls showed a negative correlation with these ratios but it was not significant, as indicated in the following table —

TABLE 19 — *Correlation between Plant Growth and Yield of Malvi Cotton, Indore, 1935*

—	A	B	C
FIELD	Total yield of <i>kapas</i> Average per plant in gms	Average ratio stem leaf per plant Fresh weight— growing stage	Weight of unopened buds, bolls and flowers at the boll- formation stage, in gms
Poor . . .	20 9	0.68	61 9
Rich	32 9	0 82	64 5

(1) r for A and B = +7992 \times , $P > 0.01$

(2) r for A and C = -0.1557, $P < 0.05$

The moisture content of the soils around the plant was also determined in both the fields at all the stages. The results are expressed on air-dry basis to get as closely as possible an estimate of free water content. The depths of sampling for each stage were chosen to represent approximately the region where most of the roots were expected to function at that stage. Sampling of soils and plants was done on six days in each period and simultaneously in both fields. During boll formation a third depth was sampled, in the rich field only because the other field was not deep enough.

TABLE 20 — *Soil Moistures during Cotton Growth, Indore—1935*

Mean percentages—Air-dry Basis

SOIL	Growing stage, 16th to 29th August		Flowering stage, 25th Sept to 12th October		Boll formation stage, 12th to 30th November		
"Variety "	3"-6"	9"-12"	3"-6"	12"-15"	6"-9"	12"-15"	18"-21"
Rich	14 3	12 9	14 4	14 4	12 7	12 3	12 5
Poor	17 4	15 8	21 7	20 9	13 2	13 1	

Up to flowering stage the poor field maintained a higher moisture level than the rich one in both horizons. During the growing stage the moisture fluctuated a little, the

upper zone being either as moist or moister than the lower zone. The moisture gradually diminished during the flowering stage and was then the same for both horizons. At maturity there was no difference in moisture content either between fields or their horizons.

The differences found in this test between the two fields were in the quantity and nature of plant growth in the early stage and in the content of free water in the soil. Plant growth was equal in later stages in both the fields when also moisture was equal. This shows that the soils in the two fields were not deficient in their nutrient content for the growth of Malvi cotton. In spite of this the plants in the poor field failed to secure sufficient nutrition in the early stage—resulting in the production of a lower proportion of stem-weight to leaf weight than in the rich field, followed by a lower yield of kapas. The capacity of the soil in the poor field to hold its initially larger quantity of moisture up to the flowering stage may have some relation to this.

(iii) *Root growth and vigour—field crops*—The differences in root-activity observed between healthy and diseased cotton plants suggested similar observations on plants differing in yield vigour. Pre-rains-sown cotton is often found to yield better than rains-sown. A replicated experiment was hence carried out in 1933 to study the roots of Cambolia and Malvi cotton sown before and after rains. Root examinations were made at three developmental stages and fresh weights of plants were simultaneously recorded. At maturity the weights of monopodial and sympodial parts were taken separately.

Two months after sowing the pre-rains-sown plants gave a higher shoot-weight than the rains-sown. At second picking, i.e., when the maturing stage was coming to an end the superiority in shoot-weight still prevailed for the Cambodia variety but not for Malvi. Pre-rains-sown plants of both varieties gave higher weights of monopodial parts than of sympodial ones.

For the two varieties the total weight and that of the monopodia at maturity were proportionate to the total weight at the age of two months.

TABLE 21.—Correlations (1933).

Correlations between.	r	P
Shoot-weight at two months after sowing and:—		
(a) Shoot-weight at 2nd picking	0.9580	<0.05
(b) Weight of monopodia at 2nd picking	0.9667	<0.06
(c) Weight of sympodia at 2nd picking	0.9031	>0.05

The pre-rains-sown plants of both the varieties produced more bolls and greater weight of kapas than those rains-sown.

This was mainly due to the maturing of more bolls and not to heavier ones.

The examination of root-lengths yielded the following results —

TABLE 22.—*Influence of age and season on root-development of cotton (with special reference to activity and death rate).*

(0.9 inches soil horizon)

	One month after Sowing			Two months after Sowing		At second Picking	
	Date of sowing	Malvi	Cam-bodia	Malvi	Cam-bodia	Malvi	Cam-bodia
Total root length (inches)	Pre-rains	97	127	191	241	99	164
	Rains	150	263	253	327	110	134
Length of active roots as per cent of total	Pre-rains	68	69	20	42	5	9
	Rains	71	74	31	49	2	6
Length of dead roots as per cent of total	Pre rains	7	5	53	34	52	44
	Rains	8	5	53	35	40	46

Significances

TREATMENTS	Total Root length		Length of Active Roots as per cent of total		Length of Dead Roots as per cent of total	
	P	Sig diff	P	Sig diff	P	Sig diff
Varieties	<0 01	4	<0 01	6	0 01	6
Sowing dates	<0 05	34	> 0 05		> 0 05	..
Stages of growth	<0 05	41	<0 05	2	<0.05	6
Varieties and stages of growth	> 0 05		<0 05	3	<0 05	8
Sowing dates and stages of growth	<0 05	58	> 0 05		> 0 05	..

The differences due to other treatments are non-significant

Statistically significant differences in root lengths were restricted to the upper 9-inch zone, which contained the major portion of the total length

The total root-length reached its maximum two months after sowing It was always greater for the rains sown than for the higher-yielding pre-rains sown crop

Percentage length of active roots was highest one month after sowing for both varieties, at both sowing dates, while that of dead roots continuously increased with the further growth of Cambodia but with Malvi it reached its maximum two months after sowing and then remained constant.

Thus, the differences observed in yield and aerial development between the pre-rains-sown and rains-sown crops were not paralleled by other properties of the root lengths except the totals for the rains-sown crop at the end of the first and second months from sowing.

Differences in availability of moisture cannot account for the greater root-length of the rains-sown crops. This seems to be due to different quantities of nutrients for every unit of soil surface tapped. The struggle of the rains-sown plants for adequate nutrition seems to be only partially successful and it seems to be more intense one month after sowing than later. Rains-sown Cambodia is presumably more handicapped than Malvi. This is illustrated in the following table.

TABLE 23.—*Root Development in relation to Plant growth of rains-sown and pre-rains sown crops*

Ratios of values of rains-sown to those of pre-rains-sown crops

VARIETY	Total Root length.		Fresh Weights.	
	One month after sowing	Two months after sowing	Whole shoot two months after sowing.	Monopodia (at second picking).
Malvi	1 6	1 3	0 6	0 8
Cambodia	3 0	1 4	0 8	0 6

The results of the studies in nitrogen changes also seem to agree with this suggestion as far as nitrogen is concerned. Attempts to keep the nutrition level of soil high for at least two months after sowing the cotton crop are likely to be a fruitful line of investigation.

(iv) *Soil moisture and crop growth in unirrigated lands of Rajputana.*—In most parts of Rajputana cotton is usually grown with one or two post-rain irrigations. An attempt was made to find how far the soil moisture level could be kept high enough to produce a fully developed unirrigated crop. In 1934, a test on duplicate plots was carried out with cotton and other crops. The treatments used and results obtained are given below :—

TABLE 24.—*Moisture-conserving treatments and yield of kharif, Jaipur 1934.*

Lbs. per acre.

NO TREATMENT	Compost.	Bandng and Intercultivation.	Bandng, Intercultivation and Compost.	Weeding.
356	509	369	460	420

Compost was added at the rate of 5 cartloads per acre.

The rainfall for the season was 20.83 inches. There seemed an indication of clean weeding or a light dressing of compost having the desired effect.

In 1935 a replicated experiment was designed to test the immediate and cumulative effect of the following treatments on cotton and other rotation crops —

Main treatments —

- 1 No bunding
- 2 Contour bunding at 100 ft distance
- 3 Contour bunding at 50 ft distance

Sub-treatments —

- 1 No manure
- 2 Compost at 5 cartloads per acre

There were six replications of the experiment. The rainfall was 19.63 inches for the season, the crop suffered from drought in the month of August, i.e., during most of its growing stage, and the yields were abnormally low.

The results, however, are interesting.

TABLE 25 — *Moisture conserving treatments and yield of kharif, Jaipur 1935*

Lbs per acre

A

CONTOUR BUNDING AT	With Compost	Without Compost
100 ft	90.4	39.9
50 ft	67.3	30.3
No bunding	75.3	29.1

B

With Compost	Without Compost	P	Sig diff
77.7	33.1	<0.01	20.1

Other differences are not significant.

It is interesting that the results of both years are similar and that a dressing of compost only at five cartloads per acre has given strongly significant differences. The similar effect of a light dressing of compost has been observed in another experiment reported later.

Soil moistures and plant weights at different stages of growth have been taken in this test, which is being continued with slight modifications.

10 *Crops other than cotton*—This has been omitted as it does not deal with cotton.

11 *Statistics and field trial technique.*—The statistical work undertaken during the year has been primarily that necessary for the proper design, conduct and analysis of the experiments referred to under other heads. The field technique of progeny row testing has been further developed, in particular by the arrangement of progenies in compact family blocks, in order to deal with problems of increasing importance involving the comparison of variances. Methods of studying the relation between root-disease incidence and root morphology have been developed for studies in the genetics of wilt resistance at Indore and root-rot resistance at Baroda.

Statistical work in connection with on-station variety trials has been continued and a paper on the results of variety testing in Central India and Rajputana has been accepted for publication in "Agriculture and Livestock in India." The technique employed has been developed into a coherent programme from preliminary small-growth tests at selected stations to widely distributed trial-cum-demonstration blocks on cultivators' fields in which varieties proved satisfactory on State farms are further tested and demonstrated simultaneously under a wide range of conditions under the cultivator's own eye. This programme is the subject of a paper now in preparation.

In connection with the improvement of plant breeding methods, a study was made and is in course of publication, of the effect of selection by current plant breeding methods on the material from which the highly successful cotton strains, Malvi I and Malvi 9 were isolated. The conclusions were drawn that though the breeding project had been very successful, its success could only be ascribed in very small measure to the methods of selection used and that a large amount of genetic variance in commercial characters easily detectable by the replicated progeny-row method of breeding had escaped notice during the years when non-replicated progeny row breeding was in use.

The statistical work of the section has been extended to parts of India not normally served by the Institute. Advice to the Cotton Root-Rot Scheme* in progress in Baroda has been continued, and the improved experimental methods devised have borne fruit in the isolation of strains resistant to root-rot and in the evaluation of their commercial characters. At the request of the Director of Agriculture United Provinces, the Genetiologist and Botanist spent a week in Cawnpore studying the cotton breeding work in progress there. In his subsequent report he emphasised the need for a closely co-ordinated testing programme embracing all stages of development from the plant breeder to the officers in charge of propaganda and distribution. In collaboration with the Statistical Assistant he drew up a draft experimental programme for the current season which has been adopted by the Director of Agriculture.

The Genetiologist and Botanist's visit to Cawnpore facilitated close collaboration between the Economic Botanist on Cotton to the United Provinces Government and the Institute in the development of the Bengals Improvement Scheme† in North Bikaner and the best products of the Bundelkhand and Rohilkhand Cotton Surveys‡ will be grown in the current season in replicated progeny rows at Cawnpore, Raya, Sriganaganagar and Indore. Some of the improved Bengals selections collected for growth in the Bengals Improvement Scheme have also been shared with the Economic Botanist on Cotton at Cawnpore.

There appears to be a growing interest in the development of the application of statistical methods to breeding problems. In addition to maintaining a considerable volume of research correspondence, training has been given to two voluntary students for the whole year and two others for periods of about six weeks each. A fifth has recently joined, and intends to stay for a year.

* Financed by grant from the Indian Central Cotton Committee to the Baroda State Department of Agriculture.
 † Financed by a grant from the Indian Central Cotton Committee to the Bikaner State Department of Agriculture.
 ‡ Financed by grant from the Indian Central Cotton Committee to the United Provinces Department of Agriculture.

12 *Miscellaneous*—(a) *Scope for manuring of crops*—Several experiments are in progress to compare the utility of green manuring, application of cattle manure or compost or of artificials, singly or together, on cotton, rice, wheat, sugarcane and other crops according to the special requirements of each locality

(i) *Unirrigated black cotton soil tracts in Malwa*—*Composts*—Immediate and cumulative effect on normal rotation crops Indefinite and non-significant results were obtained from several one season trials comparing the manurial value of composts for unirrigated cotton and groundnut The response was more definite for *jowar* and irrigated wheat

TABLE 46

Response of crops to compost

Lbs per acre.

A. *Jowar—local Malvi (1933)*

Yield of	Municipal compost	Farm compost	No manure	P	Sig diff
Grain <i>Kadbi</i> (dry)	1,012 7,762	906 4,812	837 4,512	<0 05 <0 05	105 1,065

B *Variety—Wheat, Pusa 12, irrigated once (1932)*

Yield of	Compost		Municipal compost		Ammonium sulphate		P	Sig diff
	Nitrogen, lbs		Nitrogen, lbs		Nitrogen, lbs			
	36 72	110 16	36 72	110 16	36 72	110 16		
Grain <i>Bhusa</i>	1,358 1,564	1,874 2,170	1,343 1,465	1,830 2,216	1,063 1,275	1,240 1,509	<0 05 <0 05	375 528

A long-term experiment was, therefore, started in 1933 in order to study the problem further and to find out the cumulative effects, if any, of the manures The technique for making rain-watered compost produces it at the end of the rainy season, hence the test included its application to fields as soon as it was ready, to find whether the usual pre rains application would differ in efficacy for *rabi* crops from post rains application The experiment was located in two fields of medium fertility, one of them well-drained and the other with defective drainage Rain-watered compost from ordinary farm wastes and that from habitation wastes (municipal compost) were annually applied at twenty cart-loads per acre, the high rate being purposely adopted to secure rapid results, as significant increases in yield had never been obtained by applications at a rate lower than 20 cart-loads per acre When applied after rains the manure was ploughed into the

moist soil but it was mixed with the loose surface soil by a bahar when applied to the hard dry soil before rains. The sequence of crops in the rotation was, *jowar*, groundnut, cotton and wheat. Some of the results are given below:—

TABLE 47

Efficacy of Compost Manuring on Black Cotton Soil of Medium Fertility at Indore.
Yield—lbs. per acre.

A.

Crop.	1934-35.	1935-36.	P	Sig. diff.
<i>Jowar</i>	305	816	<0 01	330
Groundnut	403	984	<0 05	331
Wheat	552	513	>0 05	

B.

Crop.	Municipal compost		Farm compost.		No manure.	
	1934-35	1935-36.	1934-35.	1935-36	1934-35	1935-36.
<i>Jowar</i>	319	1 012	320	928	248	848
Groundnut	615	1 063	351	983	283	837
Wheat	601	604	539	489	525	467

Seasons x manures P. > 0 05

C.

Groundnut (1934 and 1935).

Municipal compost.	Farm compost.	No manure.	P	Sig. diff.
788	607	555	<0 01	108

D.

Groundnut (1934 and 1935).

Time of manuring	Field No. 1 with defective drainage		Field No. 18 well-drained.		P	Sig. diff.
	Municipal compost.	Farm compost.	Municipal compost.	Farm compost.		
Before rains	958	833	767	553	} <0 05	134
After rains	849	673	678	622		

Wheat (1934 and 1935)

Date of manuring	Field No 1 with defective drainage			Field No 18 well-drained			P	Sig diff
	Municipal compost	Farm compost	No manure	Municipal compost	Farm compost	No manure		
Before rains	728	623	589	430	422	404	<0 05	61
After rains	838	805	603	458	471	446	<0 05	127

F

Crop	Municipal compost	Farm compost	No manure	P	Sig diff
Jowar	663	624	548	> 0 05	
Cotton	629	563	527	> 0 05	

Change of season did not affect the influence of the composts on *jowar*, groundnut and wheat. The results of the cotton crop are available only for one season. Significantly increased yields were obtained only with groundnut and wheat by compost application.

For groundnut, municipal compost was superior to farm compost, the application of which also increased yields on both the fields. Municipal compost was superior to farm compost on the field with defective drainage irrespective of date of application. It was so on the well-drained field only when applied before rains. Under well-drained conditions pre rains application of municipal compost proved superior to post-rains application, but there was no such difference when the drainage was defective. The behaviour of farm compost was exactly the reverse.

For wheat, the only yield increases obtained were on the field with defective drainage, due to post rain application of farm compost and to both applications of municipal compost.

The cotton crop did not appreciably respond to manuring.

The experiment needs to be continued before final conclusions can be drawn. It may be that the cumulative effect is not yet intensive enough to show appreciable differences, but the results explain why the proposition of manuring unirrigated crops is usually unattractive to the cultivator though the deficiency of his soil in organic matter is universally acknowledged by the scientific worker, on the basis of his analytical results, and is apparently supported by the high-yielding power of garden land. Farm compost was effective on wheat, and its favourable effect on groundnut was further enhanced, when applied in the beginning of their cropping season and on soil with defective drainage alone. This seems to indicate that the only thing that matters is the physical condition of the upper-most soil layer existing when the crop begins its life. It is also interesting to note that municipal compost was similarly effective on wheat only on ill-drained land, but irrespective of the date of application, and it was much more effective on groundnut when applied before rains than after. It is not possible to say definitely, on the basis of the present data, whether these two manures differ in their power to improve tilth or

whether their different effect is due to their chemical composition. Perhaps, however the absence of any such difference on the well-drained field gives a clue. Differences in nutrient composition of the manures should ordinarily be expected to be operative even there; and it is well known that the adverse effect of defective drainage may reach almost to the soil surface, the main difference between a well-drained and an ill-drained field being in the depth to which good tilth exists below the surface. Naturally if the soil tilth under field conditions reaches the required standard in the horizon occupied by the crop concerned, it is not likely to be markedly benefited further by applications of humified organic matter. Crops like wheat which need deep tilth to start with, respond to such manuring only when that tilth is absent as usually happens with ill-drained fields. Such response is more vivid when the manure is applied after rains because the improvement in tilth is then not subject to the deteriorating influence of the wet season. The groundnut crop requires deep tilth to be maintained till the pod-development is complete. It is, perhaps, because of this that it responds to manuring even on well-drained land, as the soil tilth in all fields is lowered by the end of the wet season. Application of organic matter irrespective of date, is always useful. The application of farm compost before rains is beneficial on fields with defective drainage but municipal compost also on well-drained land. This, perhaps, indicates a greater flocculating power in this compost. The higher yields obtained on the field with defective drainage with each treatment may be more due to better moisture retention after the rains because of tilth improvement, than to the nutrients. On the well-drained land, with its initial better texture, any improvement would be less pronounced.

Green manuring—Influence of different methods on wheat.

It has already been reported that while green manure might benefit a succeeding wheat crop its favourable effect was problematical on the following cotton crop. The points awaiting settlement in this problem appear to be:—

- (a) Whether green manuring would be equally beneficial to wheat in a year of low rainfall
- (b) Whether it would make any difference if the green manure is ploughed in at different stages of growth, or only laid flat on the soil surface, or cut and removed.
- (c) Whether the most suitable green cover crops—sown and cowpea for the Malwa tract—differ in their manurial value.
- (d) Whether green manuring for wheat as a system in the rotation will show a cumulative effect sufficient to benefit the cotton crop also.

Two tests, one in 1933 on medium land and the other in 1934 on rich land were carried out at Indore testing the effect on wheat of green manuring with *sown* in the different ways set out below:—

Treatment.	Approximate intervals from sowing, in weeks.	
	1933 test.	1934 test.
No green manuring		
Seedling crop ploughed in	4	
Ploughed in at growing stage	8	6
Out and removed at growing stage		6
Ploughed in at flowering stage	12	10
Out and removed at flowering stage	12	10

Both these years were very wet (51.82 and 57.50 inches respectively) Hence, the test was repeated in 1935 in a modified form The rainfall of this year was moderate (34.35 inches) The treatments in this test were —

Main treatments —

Fields—(1) defective and (2) free drainage

Sub treatments A —

Kinds of green manure (1) *sann*, (2) cowpea

Sub-treatments B —

Approximate time in weeks after sowing and method of application at each time

(a) *Periods for —*

- (1) Six weeks after sowing
- (2) Eight weeks after sowing
- (3) Eleven weeks after sowing

(b) *Methods for —*

- (4) Cutting and removing
- (5) Cutting and spreading.
- (6) $\frac{1}{3}$ Ploughing in

The last treatment was omitted for the eleven-week period for obvious reasons
The results are —

TABLE 48
Green manuring with Sann for wheat
Lbs per acre
A 1933 test (medium land)

Treatment	Grain	Bhusa
No green manuring	746	1,463
Seedling crop ploughed in	909	1,401
Ploughed in at growing stage	587	1,335
Ploughed in at flowering stage	571	1,074
Cut and removed at flowering stage	564	1,202
P	<0.05	<0.05
Significant difference	231	218

B.

1934 test (rich land)

Treatment	Grain.	Bhusa
No green manuring	933	1,121
Ploughed in at growing stage	1,063	1,251
Cut and removed at growing stage	978	1,144
Ploughed in at flowering stage	1,004	1,477
Cut and removed at flowering stage	997	1,285

C.
Dunes

No green manuring	Ploughed in	Cut and removed.	P	Sig. diff.
1 121	1,364	1,214	<0.05	170

D
1935 test (poor land).

Treatments.		Well-drained field.		Field with defective drainage.	
Interval in weeks from sowing	Method of green manuring	Kind of green manure.			
		Sown	Cowpeas.	Sown	Cowpeas
0	Cut and removed	252	388	148	280
	Cut and spread	340	280	158	316
	Ploughed in	203	470	60	668
8	Cut and removed	400	440	168	256
	Cut and spread	240	358	106	344
	Ploughed in	284	452	284	480
11	Cut and removed	368	424	140	612
	Ploughed in	424	384	180	468

E.

Kind of green manure.	Well-drained field.	Field with defective drainage	P	Sig. diff.
Sown	314	191	} <0.05	100
Cowpeas	393	48		

F

Cut and removed.	Cut and spread.	Ploughed in.	P	Sig. diff.
291	278	382	<0.05	78

In the very wet season of 1933 green manuring on a medium field had adversely affected the yields of grain and straw. This harmful effect increased with the period allowed for the green crop to grow. The depressing effect was visible even when the green manure was cut and removed. There was no depression in yields when the green manure was ploughed in during its seedling stage.

Grain yields were not appreciably affected by green manure on fertile land, whether ploughed in or cut and removed, irrespective of its stage of growth. Ploughing in the green manure, irrespective of its stage of growth, significantly increased the yields of *bhusa*, but when the green crop was cut and removed the increase was not appreciable.

In a season of moderate rainfall, 1935, different methods of manuring with *sann* or cowpea were compared on poor land with or without good drainage. The cowpea crop behaved equally well on both types of land but *sann* fared better under well-drained conditions. On ill-drained land cowpea was superior to *sann* but no such difference was observed under good drainage. Both the green manures proved better when ploughed in.

These results indicate that under local conditions green manures may depress yields even when moisture supply is sufficient. This seems to be due to unfavourable physical condition of the soil preventing aerobic decomposition.

The superiority of the coarse and woody cowpea to the soft *sann* observed on ill-drained, poor land lends support to this view. Further, ploughing in the green manure when the season is not too wet is likely to be beneficial, at any rate, on poor land. The favourable results of green manuring reported last year were obtained in a wet year on well-drained medium land which was protected from surface run-off. It seems that soil condition and not deficiency of moisture limits the efficacy of green manuring for *rabi* wheat in Malwa. Chances of successful green manuring may increase if surface wash is prevented while the green material is still rotting.

(ii) *Unirrigated soils of Rajputana—Manuring methods*—In addition to the use of green manures and farmyard manure it is common in this area to tether cattle in the dry season in different portions of a field by turns. The droppings and urine are left *in situ* to be incorporated with the soil during routine cultivation. In 1934 a qualitative experiment in duplicate plots was carried out at Basī Farm, Jaipur State. The local cattle folding method described above was compared with the modification developed at the Farm in which the dung and urine-earth was uniformly spread and mixed with the soil daily. These were further compared with dressings of cultivator's usual manure, compost and a complete inorganic manure, applied in quantities equivalent in nitrogen content to that in the dung alone dropped in the field during cattle folding. The nitrogen supplied as urine was not taken into account for this purpose. An additional treatment for comparison was the dressing of complete inorganic manure at one fourth the rate of the dose mentioned above. The local variety of cotton was grown with an irrigation in the early stage and another in October. The results are given below. The sequence of treatments in the table is based on their numerical superiority in total yields.

TABLE 49 *Efficacy of different methods of manuring*
Yield of seed-cotton—lbs per acre
Variety—*Desi* cotton (local)

Treatment.	Pickings.						Total
	1st	2nd	3rd	4th	5th	6th	
Compost	93	105	185	288	219	99	989
Cultivator's method of bullock folding	100	116	170	258	222	108	974
Basī Farm method of bullock folding	90	100	169	294	196	86	935
Cultivator's manure	54	82	141	260	219	138	894
Artificial manure, full dose	92	85	163	245	193	99	877
Artificial manure, one-fourth dose	46	58	116	294	196	84	794
Control (no treatment)	52	64	105	158	145	95	619

It seems that organic nitrogen has proved superior to inorganic similarly using well rotted organic matter instead of half-rotted or unrotted residues appears to be more desirable. Dung and urine when uniformly distributed in the soil showed no advantage over the current method of cattle-folding where urine soaks in patches and most of the dung is removed by beetles and white ants before it can become incorporated in the soil by cultivation. Earliness seems also to be associated with the higher yielding treatment. A vigorous start followed by uninterrupted development seems to be the result of such treatment.

These results are being followed up by a quantitative field trial of a complex design including the following treatments.

Main treatments

- (1) Control (no treatment).
- (2) Urine alone supplied by cultivator's cattle-folding the dung being removed and weighed.
- (3) Basal modification of cattle-folding.
- (4) Compost full dose—rate equivalent to nitrogen in full artificial manures.
- (5) Compost, quarter dose.
- (6) Complete artificial manures—rate equivalent to nitrogen in dung supplied by cattle-folding.
- (7) Complete artificial manures, quarter dose.

Sub-treatments

- (1) Control (no treatment)
- (2) Green manuring with guars ploughed in at flowering stage.
- (3) Green manuring with guars cut and removed at flowering and weighed (to be used for fodder).
- (4) Green manuring with sunn as in (2)
- (5) Green manuring with sunn as in (3).
(To be used for cattle bedding).

An intensive rotation of wheat and cotton, both irrigated, has been adopted for this test.

The results for wheat are available and are tabulated below:—

TABLE 50 *Efficacy of different methods of manuring*
Yield of wheat (local) grain—cwt. per acre.
Basal Farm, Jaipur 1935-36.

Treatment.	No green manure treatment.	Guars ploughed in.	Guars cut and removed.	Sunn ploughed in.	Sunn cut and removed.	Mean.
Control	16.6	14.4	16.5	16.6	9.7	14.4
Cultivator's cattle folding	20.9	20.2	14.6	15.1	16.9	17.6
Basal modification of cattle-folding	21.1	20.6	16.6	20.6	14.4	19.3
Compost full dose	21.2	21.9	19.4	15.2	16.6	21.4
Compost, quarter dose	17.3	19.4	14.4	15.1	15.1	16.3
Artificial manure, full dose	23.9	21.6	21.6	25.2	20.9	23.0
Artificial manure quarter dose	19.1	14.6	17.3	16.9	9.4	16.5
Mean	20.6	19.4	17.1	19.2	14.7	

Significance.

- (a) Basal manuring
(b) Green manuring
Interaction is not significant.

P

<0.05

<0.05

Sig. diff.

5.6

3.0

TABLE 51 *Efficacy of different methods of manuring*
Yield of wheat (local) *bhusa*—mds per acre

Treatment	No green manure treatment	<i>Guara</i> ploughed in	<i>Guara</i> cut and removed	<i>Sann</i> ploughed in	<i>Sann</i> cut and removed
Control	46 1	34 6	46 4	46 8	26 3
Cultivator's cattle folding	68 4	57 6	45 7	58 3	45 0
Basic modification of cattle-folding	63 7	49 7	62 7	54 4	43 2
Compost, full dose	63 7	63 0	54 0	62 7	45 4
Compost, quarter dose	57 6	52 6	40 3	41 0	39 6
Artificial manure, full dose	80 7	64 8	64 8	69 9	56 9
Artificial manure, quarter dose	61 6	43 6	49 0	50 8	32 4
Mean	62 6	52 3	51 8	54 8	41 3

Significance
Green manuring
Other factors are not significant

P
<0 05
Sig diff
9 3

The response of wheat to the manurial treatments may differ from that of cotton in some respects. It is, however, significant that only compost and artificial manures in full dose could significantly increase the grain yields, in contrast with both the cattle-folding treatments. Ploughing in green manure did not alter the effect of treatments but when it was cut and removed the treatment yields were actually lowered.

Straw yields were not affected by any treatment except the ploughing-in of the *guara* crop and the removal after harvest of both the green manures which adversely affected yield.

Concurrently with this test another field trial was carried out in duplicate plots simultaneously at six places in Rajputana, with a view to ascertain whether it made any difference on the yields of the subsequent wheat crop if (1) cattle manure is applied in the beginning of the *khari* season or at the end of it, before the *rabi* cultivation, (2) whether a supplementary ploughing-in, or harvesting and removal of green manure grown *in situ* will have any further effect. The results are given below —

TABLE 52 — *Efficacy of different methods of manuring*
Yield of wheat (local) grain—mds per acre

Places	Cattle-manuring					
	<i>Kharif</i>			<i>Rabi</i>		
	Green Manure					
	Ploughed in	Removed	None	Ploughed in	Removed	None
Alwar	18 3	17 9	12 4	18 0	18 5	14 4
Jaipur	29 3	30 6	29 3	30 3	25 6	27 5
Jodhpur	20 4	22 9	21 8	21 6	19 1	16 9

(a) Places

P
<0 05
Sig diff
5 46

TABLE 53.—Efficacy of different methods of manuring

A.—Yield of wheat (local) *blasa*, mds. per acre

Places.	Cattle-manuring					
	Kharif			Rabi.		
	Green Manure.					
	Ploughed in.	Removed.	None.	Ploughed in.	Removed.	None.
Alwar	30 5	30 8	22 4	28 5	30 8	24 9
Jaipur	71 8	70 5	60 5	72 9	67 5	63 6
Jodhpur	32 0	29 4	20 8	28 1	25 8	23 1

Significances.	F	Sig. diff
(a) Places	<0.05	20.93
(b) Time of application of cattle-manure	<0.01	2.25
(c) Green manuring	<0.05	4.40
(d) Places and time of application of cattle-manure	<0.05	2.12

The remaining differences are not significant.

B. (a) Green manuring

Ploughed in	Removed.	None.
44.1	40.8	37.4

C.

(d) Places Time of application of cattle-manure

Cattle manure applied in	Alwar	Jaipur	Jodhpur
<i>Kharif</i>	27.9	67.6	30.4
<i>Rabi</i>	28.1	65.0	25.7

As far as the grain yields are concerned it is immaterial whether cattle manure is added in the beginning or at the end of the season. Yields remain unaffected whether green manure is grown in addition and ploughed in or removed.

The yield of straw is increased, except at Alwar when cattle manure is given in the *Kharif* and it is further increased when in addition green manure is ploughed in.

Yet another experiment was carried out on the estates of Messrs the Bundi Agricultural Syndicate, Bundi State, in order to test the possible advantage of supplementary dressings of artificial manure after ploughing green manures in the land intended for wheat. Two grades of Nicifos were applied at one and two cwts per acre.

TABLE 54 *Efficacy of different methods of manuring.*

A.

Variety—Local wheat

Mds per acre

Treatment	Grain			Straw		
	Area B	Area E	Area H	Area B	Area E	Area H.
Control	29 4	28 3	32 8	40 0	44 5	46 4
Nicifos 22/18 at 1 cwt /acre	35 3	40 8	39 5	67 2	65 8	70 0
Nicifos 22/18 at 2 cwts /acre	32 0	43 9	38 1	76 1	73 7	71 1
Nicifos 17/45 at 1 cwt /acre	32 3	40 2	42 2	40 8	61 2	66 6
Nicifos 17/45 at 2 cwts /acre	37 2	39 4	42 3	73 4	81 2	80 5

Significances	..	Grain	Sig diff	Straw	Sig diff
		P		P	
(a) Manure <i>vs</i> no manure		<0 05	6 9	<0 01	14 8
(b) Units of manure		>0 05		<0 01	13 2
(c) Soil types		<0 05	4 9	>0 05	

All other differences are not significant

B

	Artificial manure <i>vs</i> no manure		Units of manure	
	Manure	No manure	One cwt per acre	Two cwt per acre
Grain	38 6	30 2		
Straw	69 0	43 6	61 9	76 0

Both grades of Nicifos were equally effective in increasing the yields of grain and straw. Increased rate of application from one to two cwts did not influence grain yield but the production of straw increased with the rate of manuring.

The results enumerated above are of great practical value for the Rajputana cultivator whose soils require manure even for unirrigated crops and whose resources of vegetable

residues for making manure are limited. Cattle urine can be utilized by the current method of folding. The droppings, which have no additional manurial effect in the system, can be made into compost together with other available residues, to be applied to fields where cattle are not tethered or folded.

Green manuring. If judiciously used has its place and it does not seem to be always necessary to plough it in. It will then be possible to secure material for composting from a sown crop and green fodder from guara. The contradictory results of the effect of green manure cut and removed as obtained in the above experiments demand further study before the exact conditions can be defined which produce the crop depression. Artificial manures can also be used singly or to supplement green manure. Thus, a great variety of resources are open (subject to economic limitations discussed below) to the local cultivator for satisfying the manurial needs of his land.

Economics.—The relative crops for cattle folding, application of compost or artificial manures has been discussed above in the light of crop response. From a practical point of view it is equally important to take into consideration the cost involved. Such records are available mainly from the Jaipur experiments.

TABLE 55. *Costs for different methods of manuring*

Ruppes per acre.

Year	Farmer's manure	Compost from		Cultivator's cattle folding	Basi modification of cattle-folding	Artificial manures.	
		Dung alone	Dung and residue.			Full dose.	Quarter dose
1934	Ra. s. p. 1 6 1	Ra. s. p. 3 4 0	Ra. s. p. 4 4 9	Ra. s. p.	Ra. s. p. 2 9 3	Ra. s. p. 31 6 0	Ra. s. p. 7 13 6
1935		3 4 0	0 10 8		3 2 3	25 15 0	6 7 9

Notes—(1) Rates Ru. per acre—

Compost: 1934—6,000 lbs.

1935—Full dose—12,320 lbs.

Quarter dose—3,080 lbs.

(2) Artificial manures—

1934—a mixture of Nitric 17/18 1 250 lbs. and pot. sulph. 1 111 2 Ra. per acre.

1935—Full dose.—Nitric 17/18 1 118 Ra. and pot. sulph. at 174 6 Ra. and pot. sulph. at 110 Ra. per acre mixed together. Quarter dose.—One-fourth of the above quantities.

Details of cost.—*Farmer's manure.*—Ten cartloads (120 mds.) of the manure were made according to the cultivator's usual method. The costs involved were: $\frac{1}{2}$ cost of making pit 2 as., churning 2 as., carting Ru. 1 0 and spreading 4 as., Total Ra. 2-2.

Cultivator's cattle folding.—No cost was involved because the land gets the treatment during routine cattle management.

Basi modification of cattle folding.—The only cost involved is for mixing the dung and urine earth uniformly with the soil. Folding was done in 1934 with three bullocks, one buffalo and one cow on a 1/35 acre plot for three days. The cost for spreading was 9 p for the plot.

In 1935 four cows and four bullocks were tethered on a 1/44 acre plot for three days. The cost involved was 9 2 p. per plot.

Farm compost making—Ten earloads (120 mds) were made in 1934 by the standard Indore method. The costs involved were $\frac{1}{2}$ cost of making pit, 4 as, churning 6 as, watering Re. 1-2, turning Rs 1-12-6, collection of bedding Re 1, carting Rs 1-9, and spreading 4 as. Total Rs 6 5 6.

In 1935, 466 3 mds. of bedding were composted by the rain-watered process with 155 5 mds of dung which produced 513 mds of ripe compost. The costs involved were collecting and removing the dung from fields Re 1-8 4, churning heaps Rs 5 0 8, and turnings Rs 2 12-0. Total Rs 9 5-0. Rate of wages for one man day of 8 hours = 4 as.

No cost is incurred by the cultivator's folding and there was no significant difference between the yields obtained by this method and by the quarter rate of compost. The yields obtained by both these methods were not significantly different from those obtained by applying compost at a higher rate. Unlike the Basu method of folding, the cultivator's method enables all the dung to be used for making compost. Hence, by adopting a system in which the cultivator's method of folding is used to manure as much land as may be possible with the available number of cattle and manuring the rest with compost made from the spare dung, it is possible to manure, for each acre given the folding treatment, fourteen acres more with compost applied at the lower rate, provided the amount of other residues is sufficient. Even when no farm wastes are available—a rare occurrence—and the dung alone is composted, 3 3 additional acres of land can easily be manured with it.

It is necessary, however, to ascertain the cumulative effects of these treatments both on cotton and wheat before final conclusions are drawn.

The results from Bundi reported above show that an average increase of about eight-and-a-half maunds of wheat per acre over the yield obtained by green manuring is possible by a supplementary application of either of the two grades of Niofos at one cwt per acre, involving a cost of Re 8-3. The gross value of wheat at Rs 3 per maund will be Rs 25-8 per acre, leaving a net difference of Rs 17-5.

(iii) *Irrigated arid soils of Rajputana*—During the last four years experiments have been carried out on cotton and other crops in the Gang Canal Colony, Bikaner, to find out the extent of profitable use of green manures, compost and artificial manures—singly or in association—and their relative values in this respect. Some of the results are tabulated below—

TABLE 56 *Response of local crops to manuring*

Gang Canal Colony, Srীগanganagar, Bikaner

Lbs per acre of grain for *toria*, wheat and *til*, *kapas* for cotton and tons per acre for maize and cowpea mixed fodder

A.

Treatments in 1932

Crop	With Compost	Without Compost	P	Significant difference
<i>Toria</i> (1932)	702	561	<0.05	88.3

Compost was applied at a rate equivalent in nitrogen content to that supplied by green manures.

B

Treatments in 1932.

Crop.	Fallow	Green manure.		P	Significant difference.
		<i>Guara.</i>	<i>Sown.</i>		
<i>Toria</i> (1932)	910	534	501	<0.05	110.0
Cotton (1933)	742	892	959	0.01	143.5

C.

Treatments in 1932

Crop.	Green manure.		P	Significant difference.
	Moughed in	Cut and removed		
Cotton (1933)	1068	850	<0.01	143.5
Maize and Cowpea mixed	5.57 tons.	4.71 tons.	<0.01	0.75 tons.
<i>Til</i>	218	170	<0.01	45.0

D

Treatments in 1934

Crop.	Fallow	<i>Guara.</i>		P	Significant difference.
		2 months after sowing.	At flowering		
<i>Toria</i> (1934-35)	1,261	1,107	1,099	<0.05	205.0
Wheat (1934-35)	1,788	1,942	1,984		

Treatments in 1934—Cotton in 1935-36

Crop	Fallow		Guara ploughed in 2 months after sowing		Guara ploughed in at flowering stage	
	*Compost	No Com post	*Compost	No Com- post	*Compost	No Com- post
Cotton	306	281	327	341	408	338

All factors and interactions are non-significant

*Compost at 20 carts per acre

F.

1934-35

Variety and treatment	Control	Castor cake at 1,000 lbs per acre	Nicifos 22/18 at 170 lbs per acre
Mollisoni			
Heavy irrigation, May sowing—			
Plant spacing 6"	673	794	1,057
" " 12"	666	782	1,089
Moderate irrigation—			
Plant spacing 12"	746	1,031	679
P 289 F			
Heavy irrigation, May sowing—			
Plant spacing 6"	724	1,153	1,140
" " 12"	782	1,102	955

Note.—Green manurial treatment was given before the *toria* or wheat crops, other crops followed without repetition of the treatments

It is quite clear that compost under local conditions benefited only the crop immediately following (*toria*, 1932). Green manure is distinctly harmful when ploughed in for a crop (*toria*) sown in October but is distinctly beneficial when it is sown in November (wheat).

Compost shows no residual effects, while those of green manure can be seen for three succeeding crops—cotton, a mixed fodder crop of maize and cowpea and *til*. The residual effect, however, is obliterated when the yields of the cotton crop are abnormally low. It makes very little difference whether the green manure is ploughed in two months after sowing or at flowering. The difference between these two periods was, however, very small (10 days). Ploughing in the green manure seems to be better than simply growing, harvesting and removing it.

The scope for the use of artificial manures seems to be even greater, but the conditions optimum for their utilization still require careful determination.

(b) *Soil erosion*.—Several plants of different habits of growth have now shown themselves capable of regenerating every year either vegetatively or from fallen seed, when grown without irrigation on the black cotton soil of Indore. In addition, there are some with an evergreen habit. Attempts are now being made to discover the best method of using them to form root-bound bunds along field contours as checks to sheet-erosion by heavy rains. Most of the crops have a good feeding value. The following table includes the most promising varieties:—

TABLE 57 *Plants likely to be useful for erosion control.*

Name.	Habit.	Mode of regeneration.
<i>Grasses.</i>		
<i>Paspalum dilatatum</i>	Stools, short.	Vegetative & seed.
Kikuyu grass	Creeping	" "
Sudan grass	Stools, erect, medium height.	" "
Guinea grass	Stools, tall.	" "
<i>Reana lururiana</i>	"	" "
Wimmera Rye grass	Stools, short.	" "
<i>Kharu grass</i>	"	" "
<i>Other plants—</i>		
Chloory	Dwarf, erect.	Seed.
Kollingi	Dwarf spreading	"
<i>Tephrosia candida</i> and <i>Fogell</i>	Tall	"
<i>Twr</i> (<i>Cajanus indicus</i>)	Tall, branching.	"

(c) *Crop rotations*. An experiment comparing five rotations was started in 1933. They were:—

Year	Rotation.				
	1	2	3	4	5
First	Wheat	Cowpeas followed by wheat.	Cowpeas followed by wheat	Groundnut.	Groundnut.
Second	Jowar	Groundnut.	Jowar	Jowar	Cowpeas followed by wheat.
Third	Twr	Jowar with twr	Groundnut.	Cowpeas followed by wheat.	Jowar
Fourth	Cotton.	Cotton.	Cotton.	Cotton.	Cotton.

The experiment has run for three years; the results with cotton are given below

TABLE 58

The Influence of previous crops on cotton at Indore.

1933—35

Yield of *kapas* lbs per acre

Year	Previous Crops			P	Sig diff
1934	<i>Tur</i>	Groundnut	Cowpeas Wheat	> 0.05	100
	177	197	153		
	<i>Jowar and tur</i>		<i>Jowar</i>	} < 0.05	
	215		331		
1933	325		333		

In 1934 cotton yields did not vary significantly whether the previous crop was *tur*, groundnut or cowpeas followed by wheat. This was a very wet year and it is not yet certain if similar results will be obtained in a normal season, because in the year 1935 of moderate rainfall, though the yields of cotton after *jowar* showed no increase, they were significantly higher after *jowar* and *tur* than in the wet year 1933. This means that in a wet year cotton yields may be depressed if the previous crop is *jowar* with *tur*.

Other crops—The yield of dry groundnuts following cowpeas and wheat, and those of wheat grain following groundnut in the previous year and a catch *kharif* crop of cowpeas are given below —

TABLE 59

Yields of groundnuts and wheat grain

Lbs per acre

Indore 1933 and 1935

Year	Groundnut	Wheat	P	Sig diff
1933	1622	282	} < 0.05	100
1935	264	379		

Differences in season made no difference in the yield of wheat. The low yields of groundnut in 1935 were due to the damage done by jackals at the ripening stage.

(d) *Eradication of Kans*—The field trials to eradicate *kans* with monsoon covers of green grass or *sann* hemp mentioned last year were completely successful. Besides achieving total eradication of the weed, the subsequent wheat crop on the former weed patches in each field grew better than in the surrounding area, and gave higher yields of a better quality of grain with more straw. The organic matter content of the soil in these patches was found, after the harvest of the crop, to be higher in the first six inches than in the soil from the rest of the field.

TABLE 60.

Influence of biological eradication of weeds on subsequent crop and soil

	Mean yield. Lbs. per acre		% Mean composition (On oven-dry basis).					
	Grain.	Straw	Soil organic matter		Grain.			
			0-6	6-15	Total nitro- gen.	Albumi- noid nitro- gen.	Gluten.	Starch.
Normal fields	477	672	0.67	0.70	1.85	0.82	8.04	49.23
Weed-eradicated patches	811	905	0.85	0.70	2.07	1.13	11.53	31.79

The method has now been adopted as a routine on the Institute Farm.

(c) *Poisoned Baits*.—*Rat-powder*.—It is well known that rats soon learn to avoid poisoned baits of the usual type; this reduces their utility. After several trials it was found that the inclusion of animal grease and glue in the baits made them irresistible for much longer and they have proved most efficacious. Baits prepared in this way met with a wide demand.

Poisoned-bait for white ants and other insects.—The composition of this bait has also been improved. It was found to be very effective at Bharatpur and Bandli where the soil was irrigated after application. Two to three applications at 20 lbs. per acre were found necessary before white ants completely disappeared.

12. COMPOST MANUFACTURE.

Farm refuse.—Rain-watered compost was made on cultivators' fields in Jaipur and Jodhpur. The work was very well organized with the following results.

At Jaipur compost was made at twenty-four places in twenty-one villages distributed all over the State. The raw materials used were *Isakhra* (village and farm refuse) *Kodbi* residues, dung, ashes, straw and other weeds. A total of 5,100 cu. ft. of raw materials was used. The yield of finished product was 63 per cent. by volume. Twenty-one cultivators expressed appreciation of the process and of the quality of the compost. Of these six complained of the extra labour of turning, two did not feel the need of such a rapid process (evidently they did not realize the increased output) and one objected to the extra space required compared with that for the usual manure heaps. Three were indifferent.

At Jodhpur in the Pali district, compost was made at five places. The quantity of raw materials used was 1,410 cu. ft. which yielded 83 per cent. by volume of finished compost. The high percentage of final product appears to be due to the extensive use of pure dung. Every cultivator considered the product superior to his usual half-rotted manure. The cultivators applied the compost to wheat fields. One of them reported increased yields. It was also used by one cultivator as a top-dressing for lucerne. Some of them preserved it for the *Kharif* crops of 1935.

14 PUBLICATIONS.

The following papers have been submitted for publication within the period of this Report —

"An analysis of the efficiency of selection methods used in the improvement of Malvi cotton" by J B Hutchinson and Kubersingh

"Genetic principles and the problem of cross breeding for milk yield in Indian cattle" by J B Hutchinson and N R Joshi

"An examination of R D Bose's analysis of a serial experiment" by J B Hutchinson and V G Panse

"The introduction of improved strains of crop plants in Central India and Rajputana" by J B Hutchinson and V G Panse

Papers were read before the bodies named, those marked with an asterisk have also been submitted for publication

At the Symposium on "Disease Resistance in Plants" held at Coimbatore in October 1935, under the joint auspices of the Indian Academy of Sciences, the Association of Economic Biologists and the Society of Biological Chemists —

"*Studies in Disease Resistance, I Cotton Wilt and Environment " By K N Ambegaonkar and Yeshwant D Wad

"*Studies in Disease Resistance, II Leaf-roll and Red leaf of American Cottons " By I Madhusudan Rao and Yeshwant D Wad

Before the Agricultural Section of the Indian Science Congress during its 23rd Session at Indore in January 1936 —

1	Optimum number of buds for sugarcane setts	G C Tambe and S C Talesara
2	Biological eradication of <i>kans</i>	G C Tambe and Y D Wad
3	*Manuring of cotton for yield in Malwa	C K Chhaya and P M Kulkarni
4	Importance of complex designs in agronomical experiments	S Shamsher Singh and P M Kulkarni
5	Treatment of sugarcane setts to improve germination and yield *Combined with No 1	G C Tambe and S C Talesara
6	The use of Revenue Settlement Records for agricultural workers.	K A Singh, L Swaroop and R K. Aurangabadkar
7	Humus supply to irrigated arid soils	S Shamsher Singh and P M Kulkarni
8	Preparatory cultivation for wheat in Malwa	G C Tambe, S C Talesara and L Swaroop
9	Cold weather cultivation of vacant fields and interculture of standing crops in Malwa	G C Tambe and S C Talesara
10	Comparative study of regional soils .	L N Desai and S. C Chakrabarty
11	*Root studies—their scope in Agronomy, I.	N S Apte
12	*Root studies—their scope in Agronomy, II .. .	K M Simlote and R K. Aurangabadkar
13.	Influence of soil moisture relationship on crop growth	I M Rao, R K Aurangabadkar and B Goswami
14	Groundnut, an investigation into its cultivation in Malwa	G C Tambe and S C Talesara
15	*Cotton yields as affected by soil condition and nutrients	S B Mogre and G T Shahane

- | | |
|---|---|
| 16. Efficient production of tobacco seed | S. B. Mogre and V N Bhargava. |
| 17. The relation between light and other factors in plant development. | I M. Rao and S. Ghosh. |
| 18. The influence of treatment and the cotton crop on the soil profile. | S. C. Chakrabarty and L. N. Desai |
| 19. Cambodia cotton in Jaipur | Tarachand Kala and G K. Sant. |
| 20. Soil texture nutrition and staple length of cotton | S. B. Mogre and Y D Wad. |
| 21. Bajra and Tur in Jaipur State | K. R. Joshi, T. Kala and P M. Kulkarni. |
| 22. Tobacco curing for bright leaf—simple adjustments | S B Mogre and G T Shahane. |
| 23. Sugar beet—a possible cash crop for Central India and Rajputana. | I. M. Rao and S. Ghosh. |
| 24. Seed quality and crop vigour | R. K. Aurangabadkar and B. Gorwaml. |
| 25. Cultivation of high quality paddy in unpuddled black cotton soils. | C. L. Nagar T. Krishna-moorithi and P M. Kulkarni |
| 26. Sugarcane x sorghum crosses in Malwa and Rajputana | G C. Tambe, S C. Chakrabarty and V R. Sathe. |
| 27. The possibility of the Soyabean crop in Central India. | R. K. Aurangabadkar and B. Gorwaml. |
| 28. Initial start to cotton seedlings with differing soils and nutrition. | I M Rao and C. L. Nagar |

Before the Medical and Veterinary Section during the same session :—

(1) The utilization of antiseptics and coagulants in composting habitation wastes " by M. A. Nicholson and S. C. Chakrabarty

(2) "The Indore process for disposing of habitation wastes at Alwar " by C. L. Nagar

A joint discussion between the Agriculture and the Medical and Veterinary Sections of the Science Congress on "The making of humus from agricultural and habitation wastes and its application, was opened by the Director of the Institute.

A letter to the Editor of Nature on the position of agricultural composts relative to that of inorganic fertilizers was published over the names of F K. Jackson and Y D Wad.

The following Bulletins and Leaflets have been published or reprinted :—

Bulletin No. 1.—"The sanitary disposal and agricultural utilization of habitation wastes by the Indore process" by F K. Jackson and Y D Wad (reprinted with additional matter)

Bulletin No. 2.—"The supply of humus to soils" by F K. Jackson, Y D Wad and V G Panse (reprinted and revised.)

Bulletin No. 4.—"Studies in the technique of field experiments" by J B. Hutchinson and V G Panse.

Leaflet No. 12.—"Eradication of Kana" (English).

Leaflet No. 13.—"The Indore method of sugarcane cultivation" (English)

Leaflet No. 14.—"Silage making from grass in parts in dry regions" (English).

THE WORKING OF THE FARM

15 FIELDS TRIALS

The following experiments were conducted —

Humus Supply—Incorporation of organic matter in the soil Green manure with weed eradication Improvement of water logged soils

Soil Improvements—Control of soil erosion by contour-strips sowing and the use of arrester crops Effect, on the succeeding crop, of cultivation of land in winter at different depths by different implements Tests on the efficiency of different implements of interculture Seedling vigour and yield of cotton

Rotation—Rotation of crops Influence of previous crop on cotton

Associated growth of crops—Association of paddy varieties with cotton, groundnut and tur

Weed eradication—Eradication of weeds by biological means

Treatment of seed—Treatment of sugarcane setts with lime-water before planting

Multiplication of seed—Paddy, 34 Varieties Soyabeans, 10 varieties Peas, 4 varieties Kikuyu grass Onions, 2 varieties Banana, 4 varieties *Reana luxurians* Sorghum sugar-cane hybrids, 6 crosses Co canes, 14 varieties

Sugarcane—Pre-treatment of cane setts Germination of cane setts with varying number of eye buds Cross wise planting of setts and stubble planting June and October planting of canes Association of varieties Rotation of varieties Response of cane varieties to top dressing with different organic manures Sugarcane, manuring of Pre servation of canes by windrowing Effect on growth and development of regulating the numbers of tillers Ratooning of varieties, first year

Lucerne—Line-sowing of lucerne with reduced irrigation Lucerne, manurial

Sugar beet—Comparison of the yields of local fodder carrots and sugar-beets

Mangolds—Small-growth trials, 10 varieties

Tobacco—Bulk cropping of cigarette, *jarda*, wrapper and *hukka* varieties

Compost—Preparation of bone char—fixing the technique Composting of cane trash—further trials Composting of cow-dung alone—further trials

16 CROPS AND YIELDS

	Yield in maunds per acre	
	Maximum	Minimum
Cotton, Malvi 9	6 0	0 75
Groundnut, Akola 10	16 22	3 40
Jowar, Ramkel	13 95	10 30
Paddy-drilled and unirrigated	4 90	
Tur	13 1	10 75
Gram	10 0	0 60
Linseed	7 20	1 67
Wheat, Malvi	9 35	2 50

Sugarcane Varietal, Field 38 H.		Ratoon 1935-36	Plant-cane 1934-35
Variety	8 48	592	319
	Co. 281	670	445
	Co. 213	702	467
	Co. 210	712	535
	Co. *90	760	610

Sugar-cane Sorghum hybrids, Field 38 K.

Co. 351	716
Co. 352	625
Co. 353	605
Co. 355	686
Co. 356	464
Co. 357	664

Sugarcane material, F 32.	Range of yield in mds. per acre	
Co. 281	503 to	673
Co. 210	616 to	782
Co. 213	988 to	1,270
Co. 290	1 008 to	1,310

Sugarcane-sotts.	Untreated.	Treated with lime.
Co. 290	717	1 043

Sugarcane yield for whole area of F 3. (1-4 acre).	Number of cane per acre.	Yields in mds. per acre.
Irrespective of treatments	31 800	1,324

Lucerne —Agronomical experiments on lucerne in previous years did not bring out any significant difference between the flat bed, narrow-ridge and broad ridge system of cultivation. In the year under report a modification was introduced in that the beds were large (75' x 35') and the seed was sown in lines with an ordinary two coultered disc drill. This ensured a saving (1) in the amount of seed, (2) in the number of irrigations and (3) expense on weeding, as interculturo by bullocks was possible.

The yields are as follows —

	lbs per acre
1935-36 Winter . . .	13,424
Summer . . .	12,278
Monsoon . . .	11,727
Total	<hr/> 37,429 <hr/>

17. GENERAL

(a) *Live Stock* —There are now 13 pairs of bullocks among which two Kankrej pairs only survive of the original 1925 purchases, the remainder having been bought in the last two years. These are of Malvi breed and of average size as usually found with cultivators.

439 cartloads of compost were prepared from the available farm wastes and 30 cartloads of night-soil compost from the residential block.

230 mds of silage was made from grass.

(b) *Workshop* —The mechanical staff were kept busy in repairing and maintaining the general upkeep of the machinery, fencing, building, roads, etc.

(c) The calculated gross returns from the Farm amount to Rs 6,500, a marked improvement on those of recent years when crop yields were lowered by adverse seasons.

(d) *Training of students and help to cultivators* —Instruction was given in practical agriculture to students from the following places, the periods ranging from a year to a few days —

Holkar State
Sikar Illaqa
Ajmer-Merwara
Khandwa (Department of Agriculture, C P and Municipality)
Mysore
Chhatarpur State
Bundi State

Batches of village teachers from the Bijalpur Normal School, Students from the Union Theological Seminary and also parties of Kumars of the Daly College, Indore, were given lectures or demonstrations according to seasonal operations.

Trained ploughmen and fieldmen were frequently sent out for demonstration work and help in special agricultural matters.

PROPAGANDA AND EXTENSION WORK IN STATES

18 VISIT TO STATES

During the year under report the Agricultural Adviser made fifteen visits to the States, the Extension Officer sixteen, the Geneticist and Botanist two, the Chemist and Agronomist six and other staff thirty-two.

19 INSTRUCTION AND TRAINING FACILITIES.

No fees are provided but practical training is given at the request of the Darbars in members of the Revenue and Agricultural staffs and selected cultivators, the programme of instruction being varied in its items to suit individual cases. No fees are charged and free accommodation is usually provided in the Institute's Visitors' quarters.

Training both in composing farm refuse and habitation wastes was given to Agricultural and Sanitary Officials and sweepers from member States and outside the latter process with the aid of the Indore Residency Area Authorities.

Lectures and demonstrations were given by the Extension Officer in district tours to large village audiences. He explained the advantages of growing good crop varieties; of increasing their manure supply by making rain watered compost from farm wastes; of making grass, *fonner* and *toyro* silage for their cattle either in pits or in mud walled silo towers, to suit the local conditions; of the practical possibility of improving their cattle by castrating "scrub" bulls; the lower cost of making better quality *gur* by the McGlashan furnace and a variety of other improvements within the capacity of ordinary cultivators.

Ploughmen trained in building the McGlashan furnace and in *gur* making were placed at the disposal of the Darbars.

Audience was also given by the Extension Officer in organizing demonstrations at Agricultural shows and cattle fairs in many of the States. Illustrative exhibits were provided, lectures delivered and cinematograph films shown of agricultural and rural uplift subjects accompanied by running commentaries.

Acknowledgment is due to the Indian Central Cotton Committee and the Central Publicity Officer, Railway Board, for the free loan of films. Four films produced by the Institute are now ready for display and others are in preparation.

(18th July 1936)

P. K. JACKSON
Director

INSTITUTE OF PLANT INDUSTRY INDORE

PROGRAMME OF RESEARCH WORK FOR 1936-37

Structure and Notes y Section

COTTON

- (1) *Botanical Survey*.—Further work in the light of
 - (a) information collected from old records,
 - (b) collection of medium staple cottons from short staple areas,
 - (c) the request of the Indian Central Cotton Committee for an investigation into the possibilities of improving Dhollerias cotton.
- (2) *Genetics*.—Study of inheritance of major factors in Asiatic and Indian American cottons.
 - Study of cases of abnormal inheritance of major factors.
 - Study of the inheritance of quantitative characters.
 - Study of interspecific hybrids with special reference to the bearing of heterosis on plant breeding procedure.
 - Study of the rate of mutation in mutable strains.

(3) *Cytology*—Study of sterile types derived from an interspecific hybrid (G arboreum G herbaceum)

Study of chromosome behaviour in F₁, F₂ and backcrosses of G anomalum x cultivated Asiatic cottons

(4) *Physiology*—Study of cotton hair characteristics

Development of tests for lint quality suitable for the needs of the plant breeder

Study of relative selection values of four simple genotypes in Malwa and Nimar

(5) *Selection and Breeding*—Propagation and distribution of Malvi 9

Study of variance in Malvi 1, Malvi 9, and the crosses between them, and re selection for further propagation according to the results obtained

Study of and re selection in progeny rows of 1933 selections

Study of problems of transference of herbaceum quality to Malvi type

Study of Cambodia selections grown at Badnawar

Study of selections in Nimar *desi* made in 1933 and grown in 1934 at Dhamnod

(6) *Variety Trials*—Variety trials will be laid down at the Institute and in the territory of member States as found necessary in the light of results obtained from current trials

(7) *Statistics*—The investigations in progress into statistical problems involved in field testing, strain testing where very small quantities of seed are available, and in the examination of segregating progenies, will be continued. Statistical methods for use in the study of quantitative inheritance will be developed with special reference to Pearson and Newman's L tests

OTHER CROPS

Work on other crops will be largely confined to the selection and purification of desirable high yielding strains for the main areas served by the Institute, and fundamental research will usually be restricted to cotton. Exceptions from this rule will occur from time to time when opportunities arise of solving general problems more easily than could be done on cotton, and plant breeding material will, of course, be used to the fullest possible extent to provide data of scientific value

(1) *Botanical*—Comparative developmental study of durum and bread wheats

(2) *Genetics*—Study of inheritance of certain characters in local durum wheats

(3) *Selection and Breeding*—Selection and breeding work will be continued on the following crops —

Kharif

Jowar

Bajra

Tur

Tilhi

Niger

Groundnut

Rabi

Wheat

Barley

Gram

Linseed

Kesari

Safflower

A part at least of the breeding material in these crops will be grown on the farms of member-States

(4) *Variety Trials*—Variety trials on all crops of interest to member-States will be laid down in the light of information gained from the current season's experiments

(5) *Lathyrism*—Work on *Kesari* is being continued and in connection with it, the botanical and agricultural problems involved in the growth of the associated weeds responsible for lathyrism are being studied

APPENDIX V

THE BOMBAY COTTON CONTROL ACT 1933.

An Act to provide for the prohibition of the cultivation of Goghari cotton and the mixing of such cotton with other cotton and for the prohibition or restriction of the possession or use of or trade in, Goghari cotton or cotton mixed with Goghari cotton.

WHEREAS it is expedient in the best interests of the growers of cotton in certain areas in the Presidency of Bombay the cotton trade and the economic prosperity of the said Presidency to maintain the quality and reputation of the cotton grown in those areas and for that purpose to prohibit the cultivation of Goghari cotton and the mixing of such cotton with other cotton and to prohibit or restrict the possession or use of or trade in, Goghari cotton or cotton mixed with Goghari cotton:

And whereas the previous sanction of the Governor General required by sub-section (3) of section 80A of the Government of India Act and the previous sanction of the Governor required by section 80C of the said Act have been obtained for the passing of this Act: It is hereby enacted as follows:—

1. *Short title and extent*—(1) This Act may be called the Bombay Cotton Control Act 1933.

(2) It extends to the whole of the Presidency of Bombay

2. *Definition*—In this Act unless there is anything repugnant in the subject or context—

(a) "Cotton" includes cotton plant, ginned and unginned cotton, cotton waste and cotton seed;

(b) "Director of Agriculture" means the officer appointed for the time being to be the Director of Agriculture;

(c) "Goghari cotton" means the kind of cotton known as *Gossypium herbaceum* (Persian Goghari); and

(d) "Controlled area" means an area specified in a notification under section 3.

3. *Power to issue notification prohibiting the cultivation, etc., of Goghari cotton*—The Local Government may by notification in the *Bombay Government Gazette* in such local area and for such period as may be specified in the notification—

(a) prohibit the cultivation of Goghari cotton; or

(b) prohibit the mixing of Goghari cotton with any other cotton; or

(c) prohibit or restrict the possession or use of or trade in, Goghari cotton or any other cotton mixed with Goghari cotton.

4. *Penalty*.—Any person, who, knowingly in contravention of the provisions of this Act or of any notification issued under section 3 or rule made under section 14—

(a) cultivates Goghari cotton shall, on conviction, be punishable with fine which may extend to rupees twenty for the first offence and to rupees fifty for every subsequent offence;

(b) (i) mixes or causes to be mixed Goghari cotton with any other cotton or

(ii) possesses, uses or trades in Goghari cotton or any other cotton mixed with Goghari cotton

shall, on conviction, be punishable with fine which may extend to rupees five hundred for the first offence and to rupees one thousand for every subsequent offence

5 *Confiscation*—Whenever an offence under this Act has been committed, all cotton in respect of which the offence has been committed and every box, receptacle, package or covering in which such cotton is contained shall be liable to confiscation

6 *Procedure in confiscation*—(1) When in any case tried by a Criminal Court, the Court decides that anything is liable to confiscation under section 5, he may, after hearing the person, if any, claiming any right thereto and the evidence, if any, which he produces in support of his claim, order confiscation.

(2) When an offence under this Act has been committed and the offender is not known or cannot be found or when anything liable to confiscation under this Act is found and is not claimed by any person, the officer authorised by the Local Government in this behalf may hold an inquiry and may order confiscation

Provided that no such order shall be made before the expiration of one month from the date of seizing the thing liable to confiscation or without hearing the person, if any, claiming any right thereto and the evidence, if any, which he produces in support of his claim.

7 *Compounding*—(1) The officer authorised under sub section (2) of section 6 may accept from any person who is reasonably suspected of having committed an offence under section 4, a sum of money as may be prescribed by rules made under section 14 by way of composition for such offence

(2) On payment of such sum, such person, if in custody, shall be set at liberty and if proceedings in any criminal court have been instituted against such person in respect of such offence, the composition shall be deemed to amount to an acquittal and no further proceedings shall be taken against such person in respect of such offence

(3) Notwithstanding anything contained in sub-section (2), it shall be lawful for the court or the officer authorized under sub section (2) of section 6 to order confiscation of anything liable to confiscation under section 5

8 *Power of entry and seizure*—(1) Any officer authorised in this behalf by the Local Government may between the hours of 6 a m and 6 p m—

(a) enter upon any land in a controlled area in which he knows or has reason to believe that Goghari cotton has been or is being cultivated in contravention of a notification under section 3, uproot or cause to be uprooted such cotton, and seize the cotton so uprooted, or

(b) enter upon or into any land, building, ship, vessel, vehicle or place in a controlled area in which he knows or has reason to believe that Goghari cotton or any other cotton mixed with Goghari cotton is kept in contravention of a notification under section 3, and seize such cotton

(2) Every officer seizing any cotton under this section shall forthwith—

(a) make a report of such seizure to the nearest Magistrate of the First or Second Class having jurisdiction to try the offence committed in respect of such cotton, specifying in such report the particulars of such cotton, and furnish a copy of such particulars to the occupier, or person in charge of the land, building, ship, vessel, vehicle or place on or in which such seizure was made, and

(b) subject to rules made under section 14, forward such cotton to the nearest officer authorised by the Local Government to receive it, for examination and for report to the Director of Agriculture

(3) The opinion of the officer authorised under sub-section (2) regarding such cotton received in any document signed by such officer shall be evidence as to the nature of such cotton in any inquiry trial or proceeding under this Act.

9. *Duty of owner, occupier and person in charge to give facilities for inspection by authorised officer.*—(1) Every owner, occupier or person in charge of any land, building, ship, vessel, vehicle or place shall give all reasonable facilities to the officer, authorised under sub-section (1) of section 8 to inspect such land, building, ship, vessel, vehicle or place.

(2) Any person who contravenes the provisions of sub-section (1), shall on conviction, be punishable with fine which may extend to rupees twenty.

10. *Previous sanction and limitation for prosecution.*—No prosecution under this Act shall be instituted without the previous sanction of the Director of Agriculture.

11. *Cognizance of offence.*—No criminal court inferior to that of a Presidency Magistrate or a Magistrate of the Second Class shall try any offence under this Act.

12. *Protection for act done under the Act.*—No suit, prosecution or other legal proceeding shall be instituted against any person for anything which is in good faith done or intended to be done under this Act.

13. *Officer acting under the Act to be public servant.*—Every officer acting or purporting to act in pursuance of the provisions of this Act shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code.

XLV

14. *Rules.*—(1) The Local Government may make rules not inconsistent with the provisions of this Act for the purpose of carrying into effect the purposes of this Act.

(2) In particular and without prejudice to the generality of the foregoing provision, the Local Government may make rules for all or any of the following purposes, namely:—

(a) to prescribe the sum of money to be paid by way of composition under section 7;

(b) to prescribe the conditions subject to which cotton seized may be forwarded under section 8;

(c) any other matter which is to be or may be prescribed.

(3) Any such rule may provide that a contravention thereof shall be punishable with fine which may extend to rupees fifty.

(4) The rules made under this section shall be subject to the condition of previous publication in the *Bombay Government Gazette*.

(5) Rules made under this section shall be laid upon the table of the Bombay Legislative Council at the session of the said Council next following and shall be liable to be modified or rescinded by a resolution of the said Council and such rule shall after notification of such resolution in the *Bombay Government Gazette* be deemed to have been modified or rescinded accordingly.

Provided that when in the opinion of the Governor in Council such modification or rescission is likely to defeat or frustrate any of the purposes of this Act, the Governor in Council may by notification in the *Bombay Government Gazette* declare that the modification or rescission shall have no effect and thereupon the rules shall remain in force as if they had not been modified or rescinded.

APPENDIX VI.

BOMBAY ACT No IV OF 1936

*(First published, after having received the assent of the Governor-General,
in the "Bombay Government Gazette" on the 16th March 1936)*

*An Act to amend the Cotton Ginning and Pressing Factories Act, 1925
in its application to the Presidency of Bombay*

WHEREAS it is expedient to amend the Cotton Ginning and Pressing Factories Act, 1925, in its application to the Presidency of Bombay for the purposes hereinafter appearing, And whereas the previous sanction of the Governor-General required under sub section (3) of section 80A and the previous sanction of the Governor required under section 80C of the Government of India Act have been obtained for the passing of this Act, It is hereby enacted as follows —

1 *Short title, extent and commencement*—(1) This Act may be called the Cotton Ginning and Pressing Factories (Bombay Amendment) Act, 1936

(2) This Act shall extend in the first instance to the Province of Sind or such area in the said Province with effect from such date as the Local Government may by notification in the local official *Gazette* appoint. The Local Government may by notification in the local official *Gazette* extend the provisions of this Act to any other area with effect from such date as the Local Government may appoint in the said notification

2 *Amendment of section 2 of Act XII of 1925*—In section 2 of the Cotton Ginning and Pressing Factories Act, 1925, hereinafter called the said Act,—

(1) after the word, comma and dash "context,—" the following shall be inserted, namely —

"(aa) 'admixture of cotton' means a prescribed mixture of different varieties of cotton," and

(2) after clause (f) the following clause shall be inserted, namely —

"(ff) 'licence' means a licence granted under section 2A "

(3) after clause (h) the following clause shall be inserted, namely —

"(i) 'Season' means such period as may from time to time be prescribed "

3 *Insertion of section 2A in Act XII of 1925*—After section 2 of the said Act, the following section shall be inserted, namely —

"2A *Licence for working cotton ginning factory or cotton pressing factory* —

(1) No cotton ginning factory or cotton pressing factory shall be worked without a licence granted to the owner thereof by such authority, in such form, subject to such conditions and on payment of such fee, as may be prescribed

(2) (a) A licence for which the prescribed fee has been paid shall be liable to be refused only on the ground that the owner or person in charge of a cotton ginning or cotton pressing factory in respect of which a licence is applied for has been convicted of an offence punishable under this Act

(b) A licence shall be liable to be suspended, withdrawn or cancelled only on the ground that the owner or person in charge of the cotton ginning or cotton pressing factory in respect of which a licence was granted has been convicted of an offence punishable under this Act.

Provided that no licence shall be suspended, withdrawn or cancelled under this clause until after the expiration of the season in which the said owner or person has been so convicted.

(3) If any person works a cotton ginning or cotton pressing factory in respect of which a licence has not been granted or has been suspended, withdrawn or cancelled such person shall be punishable—

(a) on a first conviction, with fine which may extend to five hundred rupees and if the offence has continued for more than one day with an additional fine which may extend to one hundred rupees for every day subsequent to the first day during which the offence has continued; and

(b) on every subsequent conviction, with fine which may extend to fifteen hundred rupees and if the offence has continued for more than one day with an additional fine which may extend to two hundred rupees for every day subsequent to the first day during which the offence has continued."

4. Amendment of section 3 of Act VII of 1935. In sub-section (1) of section 3 of said Act—

(i) the word "and" shall be omitted and

(ii) the following words shall be added at the end—

"and the prescribed particulars as supplied by such person of the cotton ginning or cotton pressing factory where it has been ginned."

5. Insertion of new section 3A, 3B and 3C in Act VII of 1935. After section 3 of said Act the following new sections shall be inserted, namely:—

3A. Prohibition against mixing of cotton.—(1) The Local Government may by notification in the Official Gazette declare that in any area specified in such notification and to which this Act has been extended, no cotton which is ginned or pressed in a cotton ginning or cotton pressing factory shall contain any mixture of cotton.

(2) Any owner of a cotton ginning or cotton pressing factory or any person in charge of such factory—

(a) who knowing or having reason to believe that any cotton is watered or contains seed in excess of the prescribed proportion or contains any foreign substance, gin or presses or allows such cotton to be ginned or pressed in such factory or

(b) who in any area specified in the notification under sub-section (1) gins or presses or allows to be ginned or pressed any cotton which he knows or has reason to believe to contain an admixture of cotton,

shall on conviction, be punishable with fine which may extend to five thousand rupees.

(3) Any owner of cotton who knowingly waters any cotton which is ginned and which is being or is intended to be pressed in a cotton pressing factory or mixes seed or foreign substance with such cotton, or in any area specified in

sub section (1) makes any admixture of cotton, or abets or knowingly allows or connives at any such watering, mixing or admixture of cotton, shall, on conviction, be punishable with fine which may extend to five thousand rupees

Explanation—For the purposes of this section, cotton shall not be deemed to be watered, unless such cotton contains moisture in excess of the normal quantity. The normal quantity of moisture in any given quantity of cotton is the amount of moisture that such cotton is reasonably expected to have, regard being had to the place or places at or to which, and the time or times of the year in which, such cotton has been picked, collected, stored, conveyed, left, ginned or pressed. A certificate given by the prescribed authority as to the normal quantity of moisture that a given quantity of such cotton should have and the quantity of moisture that it possesses shall be evidence of such matters, until the contrary is proved, and if the latter quantity exceeds the former it shall be evidence, until the contrary is proved, that the cotton is watered

3B *Examination of cotton, packages or bales*—(1) The Local Government or any gazetted officer authorised by it in this behalf may on its or his own motion or on receipt of a complaint that there has been a contravention of the provisions of section 3A in respect of any cotton, package or of any bale and in the case of a complaint, on payment of the prescribed fee by the complainant, cause such cotton or the contents of such package or bale to be examined by the prescribed person or body

(2) A certificate given by such person after examination of the contents of any bale under sub section (1) shall be admissible in evidence and be presumptive proof of the facts mentioned therein until the contrary is proved

3C *Entry and inspection*—(1) The Local Government may authorise any gazetted officer to enter into and inspect, at any reasonable time, any cotton ginning or cotton pressing factory for the purpose of ascertaining whether there is any contravention therein of any of the provisions of this Act or of any rule made thereunder or of any of the conditions subject to which a licence has been granted in respect of such factory and to seize all things in respect of which an offence punishable under this Act appears to have been committed

(2) The owner or the person in charge of every cotton ginning or cotton pressing factory shall give every reasonable assistance to the inspecting officer in the performance of his duties under sub-section (1)

(3) The owner or the person in charge of such factory shall, in every instance, be permitted to attend during the inspection and the things seized during such inspection shall be sealed in the prescribed manner "

6 *Amendment of section 5 of Act XII of 1925*—For section 5 of the said Act, the following section shall be substituted, namely —

" 5 *Returns*—(1) The owner of every cotton ginning factory shall submit to the prescribed authority, within such time and in such form, as may be prescribed, monthly returns showing the quantity of cotton ginned in the factory during the preceding month and from the commencement of the season to the end of that month

2 The Local Government shall compile from the monthly returns submitted under sub section (1), and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total quantity of cotton ginned in the province during the month and from the commencement of the season to the end of the month to which the returns relate

Provided that the quantity of cotton ginned in any individual factory shall not be published

(3) The owner of every cotton ginning or cotton pressing factory shall submit to the prescribed authority within such time and in such form as may be prescribed weekly returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of that week, and the approximate average net weight of the bales pressed in that week.

(4) The Local Government shall compile from the weekly returns submitted under sub-section (3) and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total number of bales pressed in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the number of bales pressed in any individual factory shall not be published :

(5) If default is made in submitting any return as required by sub-section (1) or sub-section (3), the owner of the factory shall, on conviction, be punishable with fine which may extend to fifty rupees.

(6) Where the owner of a cotton ginning or cotton pressing factory has notified to the prescribed authority that the work of ginning cotton or pressing bales in that factory has been suspended, it shall not be necessary for the owner to submit returns under sub-section (1) or sub-section (3) until such work has been resumed."

7 *Amendment of section 6 of Act XII of 1923.*—In section 6 of the said Act after the word "other than" the words and figures "the standard weights and measures weighing and measuring instruments authorized under the Bombay Weights and Measures Act, 1922, in all districts or areas in which Parts II, III, V and VI of that Act are in force or elsewhere other than" shall be inserted.

8 *Amendment of section 7 of Act XII of 1923.*—In sub-section (1) of section 7 of the said Act after the words "for the purpose of sections" insert the figures and letters "3A, 3C."

9 *Insertion of new section 11A in Act XII of 1923.*—After section 11 of the said Act the following new section shall be inserted, namely :—

"11A. *Power of Magistrate to pass sentence.*—Notwithstanding anything contained in section 22 of the Code of Criminal Procedure 1898 a Presidency Magistrate or a Magistrate of the First Class may pass any sentence provided for any offence punishable under this Act and the provisions of the said Code shall be deemed to have been amended accordingly."

10 *Amendment of section 13 of Act XII of 1923.*—(1) In section 13 of the said Act, after clause (c), the following clauses shall be inserted, namely :—

"(ca) what shall constitute an admixture of cotton ;

(cb) the period which shall from time to time constitute a season ;

(cc) the authority by whom the form in which, the conditions subject to which and the fees on payment of which, a licence may be granted under sub-section (1) of section 2 A ;

(cd) the particulars of the cotton ginning factory to be entered in the register maintained under sub-section (3) of section 3 ;

(ce) the proportion of seed which may be contained in cotton ;

(af) the person authorised to give a certificate regarding the quantity of moisture contained in any cotton and other matters specified in section 3-A,

(ag) the person authorised to examine bales under section 3-B,

(ah) the procedure for making a complaint and causing the contents of a bale to be examined and the fee for examination of the contents of a bale under sub-section (1) of section 3-B,

(ai) the manner in which the things seized shall be sealed under section 3-C "

(2) Section 13 of the said Act shall be renumbered as sub-section (1) of that section and after the sub section so renumbered, the following sub sections shall be added, namely —

"(2) The rules to be made under sub-section (1) shall be subject to the condition of previous publication

(3) Rules made under sub-section (1) shall as soon as they are made be laid upon the table of the Bombay Legislative Council for a period of one month and shall be liable to be modified or rescinded by a resolution tabled at the session thereof immediately following the expiry of the said period, such rule shall, after notification in the local official *Gazette*, be deemed to have been modified or rescinded accordingly

Provided that when, in the opinion of the Local Government, such modification or rescission is likely to defeat or frustrate any of the purposes of this Act, the Local Government may, by notification in the local official *Gazette*, declare that the modification or rescission shall have no effect and thereupon the rule shall remain in force as if it had not been modified or rescinded "

11 *Addition of sections 16 and 17 in Act XII of 1925* —After section 15 of the said Act, the following sections shall be added, namely —

" 16 *Penalty* —Whoever contravenes any of the provisions of this Act or any rule made thereunder or any of the conditions subject to which a licence has been granted to him shall, on conviction, if no other penalty is already provided in this Act for such contravention, be punishable with fine which may extend to five hundred rupees or, if he has previously been convicted of an offence under this Act or any rule made thereunder, with fine which may extend to fifteen hundred rupees

17 *Compounding offences, etc* —(1) The District Magistrate may accept from any person whose licence is liable to be suspended, withdrawn or cancelled under this Act, or who is reasonably suspected of having committed an offence under this Act, a sum of money in lieu of such suspension, withdrawal or cancellation or by way of composition for the offence which may have been committed, as the case may be

(2) On payment by such person of such sum to the District Magistrate, such person if in custody shall be set at liberty and if criminal proceedings shall have been instituted against such person, the composition shall be held to amount to an acquittal "

12 *Amendment of sections 3, 4, 6, 7, 8 and 9 of Act XII of 1925* —In sub sections (5) and (6) of section 3, in sub-section (2) of section 4, in sub-section (2) of section 6, in sub section (3) of section 7, in sub section (2) of section 8 and in sub section (3) of section 9 of the said Act for the words "shall be punished" the words "shall, on conviction, be punishable" shall be substituted

APPENDIX VII

As Passed by the Legislative Council
CENTRAL PROVINCES BILL No 33 OF 1935

THE COTTON GINNING AND PRESSING FACTORIES (CENTRAL PROVINCES
AMENDMENT) BILL, 1935

*A Bill to amend the Cotton Ginning and Pressing Factories Act 1925
in its application to the Central Provinces*

XII of 1925.

Preamble.—Whereas it is expedient to amend the Cotton Ginning and Pressing Factories Act, 1925 in its application to the Central Provinces, in the manner hereinafter appearing;

And whereas the previous sanction of the Governor-General required under sub-section (3) of section 80-A of the Government of India Act has been obtained to the passing of this Act;

It is hereby enacted as follows:—

1. *Short title and commencement.*—(1) This Act may be called the Cotton Ginning and Pressing Factories (Central Provinces Amendment) Act 1935

(2) It shall come into force on such date as the Local Government may by notification appoint in this behalf

1-A. *Amendment of section 2 of Act XII of 1925.*—In section 2 of the Cotton Ginning and Pressing Factories Act, 1925 (hereinafter referred to as the said Act)—

(i) after the word, comma and dash “context,—” the following shall be inserted, namely:—

(aa) admixture of cotton means a prescribed mixture of different varieties of cotton”;

(ii) after clause (f) the following clause shall be inserted, namely:—

“(ff) licence means a licence granted under section 2-A.

(iii) after clause (h) the following clause shall be inserted, namely:—

(i) season means such period as may from time to time be prescribed.”

2. *Insertion of section 2-A in Act XII of 1925.*—After section 2 of the said Act, the following section shall be inserted, namely:—

“2 A. *Licence for working cotton ginning factory or cotton pressing factory.*—

(1) No cotton ginning factory or cotton pressing factory shall be worked without a licence granted to the owner thereof by such authority in such form, subject to such conditions and on payment of such fee as may be prescribed.

(2) Whoever contravenes the provision of sub-section (1) shall be punishable with fine which may extend to five hundred rupees or if he has previously been convicted of an offence under sub-section (1) to fifteen hundred rupees.

(3) No licence for which the proscribed fee has been paid shall be refused, suspended or cancelled except on the ground that the owner or person in charge of the factory concerned has been convicted for the contravention of the provisions of section 3-A "

Provided that no licence shall be suspended or cancelled under this sub section until after the expiration of the season in which the said owner or person has been so convicted

2-A *Amendment of section 3 of Act XII of 1925*—In sub section (2) of section 3 of the said Act—

(1) the word 'and' shall be omitted, and

(2) the following words shall be added at the end, namely —

"and the proscribed particulars as supplied by such person of the cotton ginning factory where it has been ginned "

3 *Insertion of sections 3-A, 3-B and 3 C in Act XII of 1925*—After section 3 of the said Act, the following sections shall be inserted, namely —

"3-A *Prohibition against watering, etc , of cotton*—(1) The Local Government may, by notification, declare that in any area specified in such notification, no cotton which is ginned or pressed in a cotton ginning or cotton pressing factory shall contain any admixture of cotton

(2) Any owner of a cotton ginning factory or any person in charge of such factory who knows or has reason to believe that any cotton ginned in such factory contains seed in excess of the prescribed proportion or contains any foreign substance shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees

(3) Any owner of a cotton pressing factory or any person in charge of such factory who knowing or having reason to believe that any cotton is watered or contains seed in excess of the prescribed proportion or contains any foreign substance, presses or allows such cotton to be pressed in such factory shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees

(4) Any owner of a cotton ginning or cotton pressing factory or any person in charge of such factory who in any area specified in the notification under sub section (1) gins or presses or allows to be ginned or pressed any cotton which he knows or has reason to believe to contain an admixture of cotton shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees

(5) Any owner of cotton who knowingly waters any cotton which has been ginned and which is being or is intended to be, pressed in a cotton pressing factory, or mixes seed or foreign substance with such cotton, or in any area specified in sub-section (1) makes any admixture of cotton, or abets or knowingly allows or connives at any such watering, mixing or admixture of cotton, shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees

Explanation—For the purposes of this section, cotton shall not be deemed to be watered, unless such cotton contains moisture in excess of the normal quantity. The normal quantity of moisture in any given quantity of cotton is the amount of moisture that such cotton is reasonably expected to have, regard being had to the place or places at or to which, and the time or times of the year in which, such cotton has been picked, collected, stored, conveyed, left, ginned or pressed. A certificate given by the prescribed authority as to the normal quantity of moisture that a given quantity of such cotton should have and the quantity of moisture that it possesses shall be evidence of such matters, until the contrary is proved, and if the latter quantity exceeds the former it shall be evidence, until the contrary is proved, that the cotton is watered

3 B. Examination of cotton, packages or bales—(1) The Local Government or any gazetted officer authorized by it in this behalf may on its or his own motion or on receipt of a complaint that there has been a contravention of the provisions of section 3-A in respect of any cotton, package or of any bale and in the case of a complaint, on payment of the prescribed fee by the complainant cause such cotton or the contents of such package or bale to be examined by the prescribed person or body.

(2) A certificate given by such person or body after examination of the contents of any bale under sub-section (1) shall be admissible in evidence and be presumptive proof of the facts mentioned therein until the contrary is proved.

3-C. Entry and inspection—(1) The Local Government may authorize any gazetted officer to enter into and inspect, at any reasonable time any cotton ginning or cotton pressing factory for the purpose of ascertaining whether there is any contravention therein of any of the provisions of this Act or of any rule made thereunder or of any of the conditions subject to which a licence has been granted in respect of such factory and to seize all things in respect of which an offence punishable under this Act appears to have been committed.

(2) The owner or the person in charge of every cotton ginning or cotton pressing factory shall give every reasonable assistance to the inspecting officer in the performance of his duties under sub-section (1).

(3) The owner or the person in charge of such factory shall, in every instance be permitted to attend during the inspection and the things seized during such inspection shall be sealed in the prescribed manner.

4. Amendment of section 8 Act XII of 1925—For section 8 of the said Act, the following section shall be substituted, namely:—

" 8 Returns.—(1) The owner of every cotton ginning factory shall submit to the prescribed authority within such time and in such form, as may be prescribed, weekly returns showing the quantity of cotton ginned in the factory during the preceding week and from the commencement of the season to the end of that week.

(1 A) The Local Government shall compile from the weekly returns submitted under sub-section (1) and shall publish in such manner as the Governor-General in Council may direct a statement showing the total quantity of cotton ginned in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the quantity of cotton ginned in any individual factory shall not be published.

(2) The owner of every cotton pressing factory shall submit to the prescribed authority within such time and in such form, as may be prescribed, weekly returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of that week, and the approximate average net weight of the bales pressed in that week.

(3) The Local Government shall compile from the weekly returns submitted under sub-section (2) and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total number of bales pressed in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the number of bales pressed in any individual factory shall not be published

(4) If default is made in submitting any return as required by sub section (1) or sub section (2), the owner of the factory shall be punishable with fine which may extend to fifty rupees

(5) Where the owner of a cotton ginning factory or a cotton pressing factory has notified to the prescribed authority that the work of ginning cotton or pressing bales in that factory has been suspended, it shall not be necessary for the owner to submit returns under sub-section (1) or sub section (2) until such work has been resumed "

4-A *Amendment of section 7 of Act XII of 1925*—In sub-section (1) of section 7 of the said Act, after the words "for the purposes of sections" insert the figures and letters "3-A, 3-C."

5 *Amendment of section 13, Act XII of 1925*—In section 13 of the said Act, after clause (a), the following clauses shall be inserted, namely —

"(aa) what shall constitute an admixture of cotton ,

(ab) the period which shall from time to time constitute a season ,

(ac) the authority by whom, the form in which, the conditions subject to which and the fee on payment of which, a licence may be granted under sub section (1) of section 2-A ,

(ad) the particulars of the cotton ginning factory to be entered in the register maintained under sub section (2) of section 3 ,

(ae) the proportion of seed which may be contained in cotton ,

(af) the person authorized to give a certificate regarding the quantity of moisture contained in any cotton and other matters specified in section 3-A ,

(ag) the person or body authorized to examine bales under section 3-B ,

(ah) the procedure for making a complaint and causing the contents of a bale to be examined and the fee for examination of the contents of a bale under sub section (1) of section 3-B ,

(ai) the manner in which the things seized shall be sealed under section 3-C "

5-A *Amendment of section 13 of Act XII of 1925*—Section 13 of the said Act shall be renumbered as sub-section (1) of that section and after the sub-section so renumbered, the following sub-sections shall be added, namely —

"(2) The rules to be made under sub-section (1) shall be subject to the condition of previous publication

(3) A copy of the draft of the proposed rules shall be laid on the table of the Central Provinces Legislative Council. The Local Government shall give the Council an opportunity of discussing them, and shall take into consideration any resolution concerning the same which may be passed by the Legislative Council before finally publishing them in the local official *Gazette* "

5. *Addition of section 16 in Act XII of 1925.*—After section 15 of the said Act, the following section shall be added, namely:—

"16. Whoever contravenes any of the provisions of this Act or any rule made thereunder or any of the conditions subject to which a licence has been granted to him shall, on conviction, if no other penalty is already provided in this Act for such contravention, be punishable with fine which may extend to five hundred rupees, or if he has previously been convicted of an offence under this Act or any rule made thereunder with fine which may extend to fifteen hundred rupees."

APPENDIX VIII.

THE UNITED PROVINCES COTTON PEST CONTROL BILL

A Bill to Provide for the Proper Treatment of Cotton Seed

Preamble—Whereas it is expedient to provide for the proper treatment of cotton seed in order to avoid damage to cotton crops by the attacks of the larva of the moth *Platyedra gossypiella* Saund, commonly known as the Pink Boll-worm, and whereas the previous sanction of the Governor-General has been obtained under sub section (3) of section 80-A of the Government of India Act to the passing of this Act, it is hereby enacted as follows —

1 *Short title, extent and commencement*—(1) This Act may be called the Cotton Pest Control Act

(2) It extends to the whole of the United Provinces of Agra and Oudh

(3) It shall come into force on such date or dates and in such parts of the United Provinces as the Local Government may by notification in the *Gazette* from time to time direct

2 *Definitions*—In this Act, unless there is anything repugnant in the subject or context—

(a) "Controlled area" means any part of the United Provinces in which the Act is in force by virtue of a notification issued under sub section (3) of section 1,

(b) "Prescribed" means prescribed by or under rules framed under this Act,

(c) "Raw cotton" means the unginned bolls of the cotton plant,

(d) "Seed" means the seed of the cotton plant,

(e) "Hand-ginning" means ginning by means of apparatus operated by human power,

(f) "Treat" with its grammatical variations and cognate expressions means to subject seed to a prescribed process for the purpose of freeing it from infection by a pest

3 *Ginning of raw cotton*—In any controlled area every owner of raw cotton whether produced in or imported into that area, shall cause it to be ginned before such date as shall be prescribed, being not later than the sixteenth day of March next following such production or importation

Provided that a date not later than the first day of April may be prescribed as the latest date by which such raw cotton may be hand-ginned

4 *Treatment of seed*—Subject to the provisions of section 8, every owner of seed in any controlled area, whether such seed has been produced in or imported into that area, and every person who has undertaken the ginning of any raw cotton on behalf of another shall before a date which shall be prescribed, being not later than seven days after the prescribed date first referred to in section 3, cause such seed to be treated by such method as shall be prescribed

Provided that for the purpose of treatment of seed by exposure to the heat of the sun the date prescribed shall be not earlier than the first day of April nor later than the fifteenth day of May

5 *Prohibition against disposal of untreated seed.*—No person shall sell or otherwise dispose of any seed which has not been treated in the prescribed manner :

Provided that untreated hand-ginned seed may be sold or otherwise disposed of between the 1st day of October in any year and the 15th day of March next following

6. *Prohibition against sowing of untreated seed.*—No person shall sow or cause to be sown any seed which has not been treated in accordance with the provisions of section 4.

7 *Import of raw cotton into scheduled area.*—No person shall import or cause to be imported any raw cotton into a controlled area between the prescribed date first referred to in section 2 and the fifteenth day of September next following :

Provided that this section shall not apply to raw cotton which is conveyed by railway through the said area in closed waggons and which is not unloaded at any place within the area except for purposes of transhipment in the ordinary course of transit.

8. *Import of seed into controlled area.*—(1) No person shall import or cause to be imported any seed into a controlled area except by railway and in closed waggons and except in accordance with the terms of a licence issued under this Act :

Provided that this sub-section shall not apply to seed conveyed by railway through such area in closed waggons and not unloaded at any place within the area except for the purposes of transhipment in the ordinary course of transit.

(2) Every person importing or causing to be imported any seed into a controlled area in accordance with the provisions of sub-section (1) shall before its arrival within the said area make adequate arrangements for its treatment at a place to be specified in the licence and on its arrival shall forthwith cause it to be conveyed to the said place and there treated in accordance with the provisions of sub-section (3) :

Provided that this sub-section shall not apply to any seed so imported into a controlled area from any other controlled area, in respect of which seed it has been certified in the prescribed manner that it has already been treated in such other controlled area.

(3) The treatment provided for by sub-section (2) shall be completed—

- (a) in the case of any seed imported after the fifteenth day of September in any year and on or before the prescribed date first referred to in section 2—within fourteen days of its arrival at the place specified in the licence, subject to the provision that the treatment shall be completed not later than forty-eight hours after the prescribed date aforesaid, and
- (b) in the case of any seed imported after the prescribed date aforesaid and not later than the fifteenth day of September next following—within forty-eight hours of its arrival at the place specified in the licence.

9 *Export of raw cotton.*—The Local Government may at any time pass an order prohibiting, during such periods as may be specified therein the export of raw cotton from any controlled area, except in accordance with the terms of a licence issued under this Act.

10 *Maintenance of registers.*—Every person who undertakes the treatment of seed otherwise than by exposure to the heat of the sun shall maintain such records, register and accounts as may be prescribed

11 *Appointment and powers of Inspectors.*—(1) The Local Government may appoint such persons as it thinks fit to exercise all or any of the powers and perform all or any of the duties assigned to an Inspector by this Act or by rules made thereunder

and may define the local limits within which such powers and duties may be exercised and performed

(2) An inspector may, subject to such rules as may be made in this behalf —

- (i) enter and inspect all places in which any business connected with the ginning or sale of raw cotton or the treatment or sale of seed is carried on,
- (ii) examine any machinery installed for the treatment of seed,
- (iii) examine any seed (before or after treatment) for the purpose of ascertaining whether it has been effectively treated,
- (iv) examine any records or registers or accounts the maintenance of which is prescribed,
- (v) enter and search without warrant any premises in which he has reason to believe that raw cotton or seed is being kept in contravention of this Act or the rules framed thereunder, provided that no such entry and search shall be made except by, or under the written authority of, an inspector who is a gazetted officer,
- (vi) exercise such other powers as may be prescribed

12 *Penalties*—Whoever does any act, or without reasonable cause omits to do anything, in contravention of the provisions of any of sections 3 to 8 and 10 or of the orders issued under section 9 shall be liable on conviction before a Magistrate of the first class—

- (a) for a first offence or for a second offence in contravention of the same section—to a fine not exceeding two hundred rupees and
- (b) for a third or subsequent offence in contravention of the same section—to a fine not exceeding five hundred rupees

Provided that when any person is convicted of a first offence in contravention of any of the said sections the Magistrate may instead of sentencing him to a fine release him after admonition

13 *Orders by Magistrate for disposal of raw cotton or seed in respect of which an offence has been committed*—(1) Whenever any person has been convicted of an offence consisting of an act or omission in contravention of—

- (a) Section 3,
- (b) Section 4,
- (c) Section 6, or
- (d) Sections 7 or 8

The Magistrate at the time of passing sentence or of releasing the offender after admonition shall also pass an order directing the offender—

- in case of (a) as aforesaid, to cause the raw cotton in respect of which the offence has been committed to be ginned, and the seed so obtained to be treated, within such time as shall be specified in the order,
- in case of (b) as aforesaid, either to cause the seed in respect of which the offence has been committed to be treated within such time as shall be specified in

the order or to cause it to be removed from the controlled area concerned within twenty four hours,

in case of (c) as aforesaid, to cause the land in respect of which the offence has been committed to be ploughed over within such time as shall be specified in the order or

in case of (d) as aforesaid to cause the raw cotton or seed in respect of which the offence has been committed to be removed from the controlled area concerned within twenty four hours.

(3) If the offender has failed to comply with the order passed by the Magistrate under sub-section (1) within the time specified, the Magistrate shall direct such officer as may be empowered in this behalf to execute the order forthwith or in his direction in case of (a) (b) or (d) as aforesaid to cause the said raw cotton or seed to be destroyed by burning and all expenses incurred by the said officer in carrying out this direction shall be reported to the Magistrate and under his order shall be recovered from the offender in the manner provided by law for the recovery of fines, in addition to any fine to which the offender may have been sentenced.

14. *Power to make rules*—(1) The Local Government shall make rules consistent with this Act in respect of the following matters, namely:—

- (a) the fixing of dates by which raw cotton shall be ginned, the authorities by which such dates shall be fixed and the manner in which they shall be published,
- (b) the fixing of dates by which seed shall be treated, the authorities by which such dates shall be fixed and the manner in which they shall be published and
- (c) the methods by and the manner in which seed shall be treated.

(2) The Local Government may make such rules in respect of other matters as may be necessary for the purpose of carrying into effect the provisions of this Act.

(3) In particular and without prejudice to the generality of the power conferred by sub-section (2) such rules may provide for:—

- (a) the conditions on and circumstances in which an area may be declared to be a controlled area,
- (b) the issue of licences and certificates under section 8, the authorities by whom such licences and certificates may be issued the conditions of such licences and the fees, if any which may be charged for them
- (c) the specification in licences of places for the treatment of seed imported under sub-section (1) of section 8
- (d) prescribing the authority by whom and the conditions under which a licence may be issued for the export of raw cotton from a controlled area,
- (e) the maintenance of records, registers and accounts according to the provisions of section 10
- (f) the appointment of inspectors and the exercise by them of the powers conferred by section 11 and the conferring on them of such other powers as may be necessary for the purposes of this Act,
- (g) the empowering of officers to carry out the orders of a court under sub-section (3) of section 13 and the manner in which such orders shall be carried out and
- (h) the delegation of its powers by the Local Government.

(4) All rules made under this section shall be subject to the condition of previous publication

(5) All such rules shall be published in the *Government Gazette* and shall, unless some later date is appointed, come into force on the date of such publication

15 *Delegation of powers*—The Local Government may delegate such of its powers under this Act, as it thinks fit, save the power to make rules under section 14, to the Divisional Commissioner or the Director of Agriculture or to a District Officer, in accordance with rules framed under this Act

16 *Protection to persons acting under this Act*—No suit, prosecution or other legal proceeding shall lie against any person for anything which is in good faith done or intended to be done under this Act

STATEMENT OF OBJECTS AND REASONS

The cotton crop of the United Provinces is subject to attack by the caterpillar of the moth *Platyedra gossypiella* Saund, commonly known as the Pink Boll-worm of cotton. The larva is carried over from season to season in cotton seeds which the caterpillar hollows out and in which it lies dormant until the favourable conditions produced by the monsoon bring forth the moth, the latter lays its eggs on the cotton plant and the larvæ when they emerge find their way into the cotton buds or bolls

2 This pest destroys upwards of 25 per cent of the crop in normal years and in some years reduces the return to the grower by half, the normal loss to the cultivator is estimated at from Rs 10 to Rs 15 per acre. Further, the intensity of this infestation coincides with the period of development of most of the bolls in varieties of cotton of greater lint length and better spinning quality, thus preventing the profitable growth of better varieties in the province. It is therefore necessary to control the pink boll-worm pest to enable cotton to be more extensively and profitably grown

3 As a result of continued research it has been ascertained that the treatment of all cotton seed by heating it to an appropriate temperature diminishes the attacks of this pest, with consequent increase in yield. It is possible to deal with small village stocks by exposing cotton seed to the heat of the sun for two hours in April and May. But other methods are necessary if large stocks are to be rendered innocuous. Heating in special heaters at the time of ginning is the only safe remedy. Legislation is therefore required to ensure that organized treatment of all cotton seed should be properly carried out by approved methods in suitable cotton growing areas so as to increase the outturn and improve the quality of the cotton crop, for the benefit of the cultivators and also of the cotton industry in the province

J P SRIVASTAVA,
Minister for Education

NOTES ON CLAUSES.

Clause 3—Experience has shown that unginned cotton cannot be conveniently or satisfactorily treated, accordingly it is proposed that ginning should be completed by a particular date, so that the seed may be effectively treated at the proper time. The exact date would vary according to the season and locality and the variety of cotton grown

and it is therefore proposed to leave the notification of this date to be prescribed by rules and only to mention the latest date in the Act itself.

Clause 4.—It is necessary that all seed within a controlled area should be treated in such manner as to prevent any possibility of its serving as a source of reinfection of the new crop. It is also necessary that the treatment should not damage the seed.

It is proposed to leave the method of treatment to be determined under the rules of the Act. At present the most satisfactory known methods of treatment are by sun heat or by steam heating apparatus. Future research in India or elsewhere may however discover other and more economical methods, e.g., electrical treatment. A greater degree of sterility is attained in the choice of methods if the matter is left to be decided by rule than if specific preference is incorporated in the Act itself. Moreover it will then be easier to allow discretion to factories to put up such boilers as they think suitable provided they comply with the requirements of the rules.

It is necessary to fix a final date for the treatment of seed to ensure that there shall be no serious danger of reinfection of the planted crop through the emergence of moths from untreated stocks. Periods of moist heat such as occasionally occur from April onwards, stimulate the emergence of the adult insects. It is therefore proposed to provide for such fixation of date as would combine the maximum of protection compatible with practicable treatment.

Sun heat is generally not strong enough for seed treatment before April. April 1 is therefore proposed as the earliest date to be notified for such treatment. It would be desirable that all treatment should be completed by April 15 but this may not be practicable and it is therefore proposed to allow a further month for the purpose. In practice the date for particular areas are expected to be determined under the rules the main determining factor being whether or not cotton is sown under irrigation. In any case the treatment should be completed before the first sowing date.

In normal practice factory-ginned seed would be treated within a few hours of ginning. A margin of seven days is suggested to safeguard ginners in the event of their seed treatment being in arrears of their ginning. It is intended that the date actually fixed under the rules by the authorities concerned will be determined to suit the convenience of the ginning interests. In practice this is likely to be much earlier than the extreme date as ginners would prefer a fully employed shorter ginning season than one in which bales continue to be delivered late in drafts involving frequent slack or idle periods.

Clause 5.—It is essential to the smooth working of any scheme of control that no stocks of untreated machine-ginned seed should be allowed to leave from the ginnery premises at any time. The ultimate destination of such issues could only be determined by a system of checks and enquiries which would be laborious to inspecting officers and vexatious to the trade and the success of which could not be guaranteed. There is of course no limitation to the movement of treated seed, and consequently no danger that this provision will interfere with adequate seed supply.

Clause 6.—The sowing of untreated seed has to be prohibited if the pest is to be brought under control.

Clause 7.—The importation of raw cotton after the close of the factory ginning season would be a serious menace and has no commercial justification. If required to augment the seed supply the necessary seed can be imported as such.

Clause 8.—It is necessary to preclude reinfection of a controlled area by the introduction of infected seed. It is therefore proposed that control should take the form of licence to import which will be issued by the Collector or other officers, to whom powers have been delegated for the purpose.

Seed certified to have been treated in another controlled area will be under no restrictions. Untreated seed must be treated effectively and reasonably quickly, and there must be adequate safeguards against reinfection prior to treatment. These requirements are met by permitting import by rail only, and to places in which treatment facilities are available and have been arranged for by the importer, by importing in sound bags, and by limiting the time the seed may be held pending treatment.

Importation of untreated seed by road has to be absolutely prohibited. The dangers of reinfection from such a source are obvious, both by escapes during transit, and by possible leakages *en route*.

Clause 9 —It has been urged on behalf of ginners that if they have to bear the cost of the treatment of cotton seed, they can only do so by increasing their ginning charges. The latter may result in cultivators taking their raw cotton outside the controlled area for ginning purposes. Accordingly, it is provided that the Local Government may by order prohibit the export of raw cotton from the controlled area, except under licence during such periods as may be specified. Normal trade relations will not thus be affected.

Clause 10 —It is necessary that all persons who engage in power ginning of *kapas* should maintain sufficient records of the *kapas* received for ginning, of the treatment of the ginned seed, and of the issues of the seed as will enable a check to be maintained. Provision for the maintenance of the majority of such records is included in the Cotton Ginning and Pressing Factories Acts. This however only applies to such ginning premises as come under the Factories Act. Hence the maintenance of such records as may be necessary has to be provided for.

Clause 11 —It is not anticipated that any special staff will be required to be appointed as inspectors under the Act. The staff required for propaganda and supervision in the villages will presumably also function as inspectors within prescribed limits. The powers actually entrusted to inspectors will be more or less circumscribed in accordance with their status.

APPENDIX IV

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON

BOMBAY.—Borach Tract.—The group of Borach Co-operative Cotton Sale Societies which was taken up last year within the controlled area for 1927 A.L.F. reverted to the policy of growing an earlier *Selection 1* seed as better prices were not realised for 1927 A.L.F. during the previous year as a result of damage due to frost; this group was accordingly excluded from the Departmental supervision during 1925-26 as a result of which the controlled area was reduced from 23 781 acres to 12,876.

Out of 1 045 411 lbs. of 1927 A.L.F. seed purchased last season 289 616 lbs. were supplied to Chhota Udepur and the remaining 755 795 lbs. were distributed from 20 depots in the Surat tract. Besides the Hansot Co-operative Cotton Sale Society supplied 23 495 lbs. seed direct to its members, the total quantity of seed distributed thus being 1 118,000 lbs. The Rajpipla and Baroda States obtained their requirements of seed locally.

DECCAN.—Ahmednagar District.—Of the total area of 188,695 acres under cotton in this district during the year 1925-26, 1,981 acres were under *Banilla* which the Agricultural Department is trying to spread. This variety gives better yield than the local mixture and fetches Rs. 6 to Rs. 6 per *Khandi* of 500 lbs. of *kopas* more than local cotton.

Solapur District.—In this district the total area under *Banilla* cotton was 9,200 acres. Its popularity among cultivators is increasing owing to its higher yield and also because the prices it fetches are better by Rs. 6 to Rs. 8 per *Khandi* of 500 lbs. than the local variety. The dry crop gives 250 to 400 lbs. of seed cotton per acre on an average and the irrigated crop 500 to 1 000 lbs.

DECCAN CANALS.—The total area under cotton in the Deccan Canals *viz.*, Godavari Pravara and Nira Right and Left Bank Canals, was about 20 000 acres during the year 1925-26 against 17 000 acres during the previous year. The slight increase in acreage may be attributed to the better prices realised for seed cotton during the 1924-25 season. The Agricultural Department is continuing its propaganda for the extension of *Banilla* cotton in the canal areas where the area at present is about 6 000 acres. The Department has distributed in all about 30 000 lbs. pure seed of *Banilla* cotton; local merchants arrange for *Banilla* cotton to be ginned separately and they keep the seed for sale.

Khandesh.—The improved variety of cotton evolved by the Bombay Agricultural Department and named *Banilla* cotton (being a cross between *Bani* and *Comilla* varieties) has been introduced for general cultivation in Khandesh. In favoured localities it gives satisfactory yields, produces better and finer staple and possesses a 40 per cent. ginning output as compared to 34 per cent. of the local Khandesh cotton. During the year 1925-26 the area under *Banilla* cotton was about 125 000 acres representing about 10 per cent. of the total area under the cotton crop in the Khandesh tract (East and West Khandesh and Nashik districts). The output is estimated at 20 000 bales or on an average 100 lbs. of lint per acre.

A seed distribution scheme of the Indian Central Cotton Committee is in operation in this district and under it a total area of about 20 000 acres was organised for the multiplication of pure seed and 825 000 lbs. of seed were stocked for distribution in the coming season. *Banilla* cotton has been found to give higher yield and to be of better quality in the black soils of the Tapi belt than in the lighter types of soils.

KUNTA.—Dhorewar Tract.—The work of introducing two improved varieties of cotton, *viz.*, *Jayawari* and *Gadag No. 1* was carried out on an extensive scale through the Hubli and Gadag Cotton Sale Societies with the aid of funds provided by the Indian Central Cotton Committee. The reserved area maintained for multiplying pure pedigree

seed of *Jayawant* cotton at the Hubli centre was 25,377 acres against 21,000 acres last year and that of *Gadag No 1* at the Gadag centre was 25,259 acres as against 25,012 acres of the previous year. The quantity of seed received by the Societies from these reserved areas was 1,281,670 lbs of *Jayawant* and 1,036,811 lbs of *Gadag No 1*, sufficient to cover 128,167 and 103,680 acres, respectively, during 1936-37.

For distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed depôts were opened as usual in different selected centres. The general area grown with pure seed was 118,423 acres for *Jayawant* cotton as against 126,286 acres last year, and 58,434 acres for *Gadag No 1* cotton against 65,238 in the previous year. The estimated yield of *Jayawant* was 13,020 bales as against 15,000 bales last year, and 7,800 bales of *Gadag No 1*, as against 4,600 bales in the previous year.

The Hubli Sale Society also sent outside its area of operation 590,100 lbs of *Jayawant* seed enough for 59,010 acres. The total area under pure seed of *Jayawant* cotton was, therefore, 177,433 acres as against 191,336 acres last year. The Gadag Sale Society also distributed 84,163 lbs of *Gadag No 1* seed, enough for 8,416 acres outside its own area of operation. The total area under *Gadag No 1*, therefore, came to about 92,109 acres.

With a view to spread *Jayawant* cotton in other areas, separate seed multiplication blocks of 5,847 acres at the Athani centre, 933 acres at Bailhongal and 500 acres at Bagalkot were organised. 476,000 lbs of pedigree seed, enough for 47,600 acres, have been stocked for distribution during 1936-37.

Jayawant cotton obtained an average of Rs 4 more per *naga* of seed cotton (1,344 lbs) in auction sales and *Gadag No 1* Rs 8 more per *naga*. In the Athani centre the buyers gave on an average Rs 20 more per *naga* of seed cotton (1,344 lbs) over local *Kumta*.

SIND—Three main classes of cotton have been found to be successful in Sind, viz, (a) *Sind deshi*, (b) *Sind-American*, (c) Imported *Egyptian* and *Sea Island* cottons.

Among each of these three main classes the Department of Agriculture in Sind has, by botanical selection, evolved improved strains which on account of better yield, high ginning outturn or superior quality, are suitable for extension in general cultivation in the different cotton growing tracts of the Barrage areas.

Sind Deshi Cotton—This cotton has a special market of its own on account of its bright colour and rough feel, being suitable for mixing with wool. It is very hardy and resists variations in soil, climate and season. It is capable of giving high yields and can be sown late, i.e., in the month of June. The improved *Sind deshi* strain 27W.N. now known as "*Sind N R*" cotton, evolved by the Agricultural Department, gives an early and abundant crop (about 16-20 per cent greater outturn than ordinary *Sind deshi* and a 4-5 per cent higher ginning outturn, i.e., 38-39 per cent). This improved *deshi* strain is now the standard *deshi* cotton in Sind. Trade opinion in Karachi considers that the total *deshi* crop, which can be profitably consumed, should not exceed 200,000 bales per annum. Any increase above this figure is expected to glut the limited market and result in reduced prices to the growers. The total area under *deshi* cotton in 1935-36 was 463,834 acres (including Khairpur State) with an estimated outturn of 189,800 bales of cotton.

Sind-American Cotton—This cotton occupied in 1935-36 about 378,075 acres out of the total cotton area of 841,909 acres. 4F cotton has been the most popular variety grown in Sind. It has been partly replaced by other types, viz, 289F, N T and K T cottons, but as the latter two have been found to be easily susceptible to red leaf disease and jassid attack their cultivation is being given up. The improved strains, established by the Agricultural Department, seed of which is being rapidly multiplied on a large scale, are definitely superior to the ordinary *Sind-American* and are quite distinct from the original material from which they have been evolved. These are —

Sind-American 4F-98—This cotton has a staple length of $\frac{7}{8}$ " to 15/16" and spins 34's counts, it gives a high yield and has a ginning outturn of 33 per cent. This strain

forms the bulk of the crop in the new cotton growing areas on the Right Bank of the Indus, where it has been found to be the most suitable type for cultivation.

Sind Sudkar (289F 1).—This improved strain has a staple of 1 1 1/16 long and spins 40's. It has a ginning percentage of 78.30 and in normal years is a very high yielder. This cotton is more resistant to red leaf disease, jassid attack and can withstand seasonal variations of climate better than ordinary *Sind American*. Recognized as the "bread and butter" of the cotton growers in Sind in the Barrage areas it is now being grown in general cultivation all over the Left Bank of the Indus.

Imported Egyptian and Sea Island Cottons.—Selected strains of these cottons, acclimatised in Sind, have been produced by the Sind Agricultural Department, viz., (1) *Sea Island* 2-4 and (2) *Boss III* 16 which have a staple length of 1 1/2 1/4 and are suitable for spinning 70-80's. Though tests on field scale show that strains grow well in East Sind, they are however susceptible to white ant attack, specially on virgin soils, and to seasonal variations. The area under the strains mentioned was during 1935-36 about 1 450 acres, and the average yield was about 8 maunds *kapas* per acre as against 12 maunds of *Sind-American* on good lands. These fine quality cottons need better soil and better cultivation than *Sind-American* or *dechi* cotton.

The economic side of the question, which is of primary importance to the grower depends largely upon the prices prevailing for the various types of cotton. During 1935-36 these cottons were sold in large quantities both in Karachi and Bombay at the following rates:—

	SALE OF COTTON LINT IN 1935-36					REMARKS.
	Price per candy of 784 lbs.	Premium over Broach				
		Rs.	a.	p.		
SIND N R. (37 W N)	174	8	3			Karachi delivery
SIND AMERICAN —						
4F 98	206	10	10	19 10 10 on	187	
285F.2	226	15	0	39 15 0 on	187	
Sind Sudkar	257	0	0	80 0 0 on	187	Bombay delivery
SIND EGYPTIAN AND SEA ISLAND—						
Boss III 16	337	0	0	150 0 0 on	187	
Sea Island 2-4	337	0	0	150 0 0 on	187	..

For successful cultivation of long-stapled and fine quality cottons it is necessary to evolve a reliable marketing organization which will secure adequate premium for quality from the trade. Indian mills have of late shown considerable interest in these long stapled cottons and in order to ensure future supplies it is for them to encourage their production by offering the requisite premiums. The growers of Sind American cotton as also the ginners, are in constant fear of not getting an adequate price for staple cotton marketed in pure conditions.

MADRAS.—I. The Southern Tract—(A) Cambodia—Coimbatore.—(1) The multiplication of pure Co 2 Cambodia cotton seed for distribution to cultivators continued as usual, through the annual contract of seed farms with co-operative seed societies and

individual *ryots* During the year there were 883 acres (under annual contract) of seed farms with four societies consisting of 130 members at Palladam centre as compared with 854 acres, 3 societies and 105 members in the preceding year This area is under the direct supervision of the Agricultural Department and is known as the "Inner Area" The seed from the "Inner Area" was, as usual, supplied to the Tiruppur Co-operative Trading Society, Ltd, Tiruppur, which with assistance from the Local Government and the Indian Central Cotton Committee runs what is called the "Outer Area" comprising 5,320 acres, with 21 societies in Palladam and Avanashi Taluqs, the corresponding figures for the previous year were 5,152 acres, the number of societies being unchanged The total seed farm area in 1935-36 was 6,203 acres as against 6,006 acres in the previous year.

(u) Pure *Co 2* seed produced by the Agricultural Department and the Tiruppur Co-operative Trading Society, including the natural spread, is estimated to have covered 153,000 acres in the district during the year as against 66,000 acres in 1934-35, while 13,168 lbs of *Co 2* seed sufficient for sowing about 525 acres were supplied to other districts in the Presidency Due to adverse weather conditions during 1935-36 season, the yield was about 50 per cent less than normal and consequently there will not be much scope for increase in this strain in the coming season

(uu) *Cambodia—Trichinopoly*—In the Trichinopoly District 59,069 lbs of *Co 2 Cambodia* seed were distributed to the *ryots* by the Agricultural Department, as against 21,700 lbs distributed in the previous year The area covered by this variety during the year was 6,090 acres

(vv) *Cambodia—Madura*—The area under *Cambodia* seed farms (*Co 2*, 920 and 1267) was 172 acres as against 176 acres in the previous year The quantity of seed from the seed farm distributed during the year was 31,047 lbs, enough to cover an area of 2,079 acres as compared to 68,635 lbs for 4,575 acres in 1934-35 The area under this improved strain as a result of distribution among *ryots* and other agency is estimated to be 42,037 acres

(B) *Karunganni—Coimbatore*—(1) The multiplication of *C 7 Karunganni* strain of Tinnevely tract which has become popular in the Coimbatore District was continued through seed farms as for *Co 2* with a corresponding reduction in the Uppam area During the year under report there were 542 acres of seed farm at Udumalpet with 19 *ryots*, as against 745 acres of seed farm with 20 *ryots* in the preceding year With the distribution of 54,992 lbs of *C 7 Karunganni* cotton seed in 1935-36 and including the natural spread, the area under this strain is estimated at 28,000 acres, with an estimated yield of 5,200 bales of 400 lbs. net The seed farm lint of 1934-35 commanded an average premium of Rs 5 per candy of 500 lbs on the date of sale

Karunganni—South—(i) The area under *Karunganni* strains *C 7*, *A 10* and *KPT 1* seed farms was 1,292 acres as against 1,330 acres of the previous year *KPT 1* (Strain No 2622) is replacing strains *C 7* and *A 10* as it is a better yielder than either of the two and it does well in bad seasons also The quantity of seed distributed from seed farms in 1935-36 was 181,700 lbs sufficient for an area of 15,100 acres as compared to the distribution of 133,800 lbs for 11,100 acres in 1934-35 The area (including seed farms) under these strains as a result of distribution among *ryots* is estimated to be 153,200 acres

(ii) In the Trichinopoly District, 3,270 lbs of *C 7 Karunganni* seeds were distributed to the *ryots*, about 695 acres were sown to this cotton

II NORTHERNS AND WESTERNS TRACT—*A Northern*s—(*N 14*)—The seed farms under *N 14* variety were again started at the instance of Messrs Binny & Co, on an area of about 90 acres distributed in the *talucs* of Nandyal, Koilkuntla and Sirvel of the Kurnool District where this variety was reported to thrive better than in other *talucs* in the tract The average yield of *Lapas* per acre during 1935-36 was 200 lbs as compared to an exceptionally good yield of 350 lbs during 1934-35 The premium paid by Messrs Binny & Co this year was Rs 30 per candy of 500 lbs against Rs 10 to Rs 15 in the

previous year. There is now on hand a stock of seed sufficient to sow about 1,000 acres during the next sowing season. The area of natural spread under this variety is reported to be about 2,240 acres.

II. Madras.—II 1 strain.—The seed farm during 1935-36 was concentrated in nine villages round about Pantakal and covered of 3,205 acres against an area of 2,533 acres during the previous year. Due to adverse seasonal conditions and consequent low yield during the previous year 62,520 lbs. only of II 1 seed could be distributed during the year as against 291,233 lbs. in the previous year. The average yield during 1935-36 was 225 lbs. of linters per acre. This variety has spread to the Prokdiatur taluk of Cuddapah district where it is reported to be grown on about 5,000 acres. The total natural and departmental spread under II 1 during the year under report are 214,653 acres and 8,610 acres respectively.

CENTRAL PROVINCES AND BIKANER.—The outstanding feature of the year was the success achieved by the new strain F 434 which has proved its superiority over the other strains in practically all parts of the province in spite of an unfavourable season. Grown under varied conditions of soil and climate it has proved to be the best all round type, more resistant to the vagaries of climate, hardly prolific and superior in staple. As a result it has now been fairly widely introduced in many places in these provinces, gradually replacing *Perrus 28*. Its spinning performance is excellent, being adjudged suitable for spinning highest standard warp counts of 27's. The total area under *Perrus* cotton in the Central Provinces and Bikaner during the year 1935-36 was 102,837 acres; statistics collected show that *Perrus* cotton equivalent to 18,075 bales was marketed up to the end of April 1936 out of which 12.0 bales were F 434, 4.0 438 and late *Perrus*.

UNITED PROVINCES.—C. 402.—Over 1,400 acres of this strain were grown in the Haridwar district with the assistance of the staff provided by the Indian Central Cotton Committee. A considerable proportion of the crop was handled by the U. P. Cotton Purchase and Sale Society, Bijnor, with great success, and as a result of this, and of departmental propaganda, the area sown for 1936 crop was nearly doubled.

C 402 combines improved fibre quality with high ginning percentage and is regarded by the local mills as superior to *Drach*.

C 5*0.—This selection continues to spread on account of its early maturity, high yield and high ginning percentage; the fibre properties are much superior to the average *Ungola*.

PUNJAB.—(i) The total area under American cotton in British districts was 1,305,500 acres, of which 4 F was grown on 1,118,900 acres and 289 F on 64,600 acres. 43-F, a new early maturing cotton recently evolved by the Cotton Research Botanist, was grown on an area of 5,000 acres; it is estimated that the area under this cotton will rise to over 25,000 acres during 1936-37.

(ii) Out of 1,497,300 acres under *Desai* cottons in the Province (excluding Indian States) during the year *Mollisoni* was grown on 571,500 acres, the greater proportion being under new types—15 *Mollisoni* and 39 *Mollisoni*.

(i) **American Cotton—4 F.**—This is a new early strain and has all the desirable characteristics of 43-F with the addition of a higher ginning output. The plant is very sturdy and hairy and is thus resistant to *Jassids*. During the last two years the yield of this strain in the comparative trial plots has been very satisfactory.

(ii) **Desai Cotton.**—With a view to improve the length of lint of *Desai* cotton 15 *Mollisoni* was crossed in 1930 with Million Dollar, a Chinese cotton with medium lint. Successive hybrid generations were critically examined to find out a suitable combination of desirable characters in one plant, and as a result a variety called "Jubilee Cotton" has been evolved which resembles *Mollisoni* in outward appearance, but has a much superior lint. A comparison between the spinning performance of 4 F "Jubilee Cotton" and *Mollisoni* showed that 4 F can spin on the average 21 s, ordinary *Mollisoni* 6's to 8's

and "Jubilee Cotton" from 16's to 18's Messrs E D Sassoon & Co, Bombay, who spun a bale of this cotton and made it into sheeting cloth expressed themselves highly satisfied with its performance both on the spindle and on the loom

BURMA—The total area under improved strain *C 19* was 4,251 acres, the resultant crop gave an average ginning outturn of 38 per cent as against 32 per cent ordinary *Wagale*. The total quantity of *kapas* of the improved strain ginned at the Mahlaing Central Farm ginnery was 111,771 *viss*, and 63,172 *viss* of *C 19* seed are available for distribution

As a result of experiments conducted at Mahlaing Central Farm two hybrid strains *L11 x W6* and *C19 x W5* were found to be superior to *C 19* and *Wagale* in quality as well as yield. The commercially ginned crop of these hybrid strains spun and reported on very favourably by the Master Spinner of the Myingyan Spinning Mill, thus confirming the original report of the Technological Laboratory (*vide C A No 16*). In consultation with the trade it has been decided to multiply these two strains in separate tracts

RAJPIPLA STATE—The Rajpipla State has continued its policy of maintaining the improved strain 1027 *A.L.F.* as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution by way of *Takari* of selected seed obtained by special arrangement for the purpose, (2) by the Cotton Transport Act which prohibits and penalizes the sowing or importing into the State for purposes of sowing *Goghari* cotton seed or any other short staple seed and (3) by the control of ginning and pressing factories for the prohibition and prevention of admixture of short staple varieties with the pure 1027 *A.L.F.* crop of the State. As a result of these measures the cultivators of the State have always found a ready market for their cotton at their own doors. Besides the practice of organizing meetings at different agricultural centres of the State for the sale of the cotton crop to the highest bidder has resulted in cultivating a spirit of combination among the growers to dispose of their cotton at the best prices

(2) Rajpipla cotton (known by the term *Jhagadia* cotton in the market) is now recognised as equal to the very best cotton and is largely sought after. A notable feature of this year also was that though the seed was selected from the local crop of 1027 *A.L.F.* variety the crop flourished so well that the State was able to put in the market the highest output of cotton *viz.*, 36,078 pressed bales ever achieved since 1924, the year when compulsory cultivation of 1027 *A.L.F.* variety of cotton was introduced in the State, the quality of the crop this year also maintained its usual high standard

BARODA STATE—(1) *Navsari District*—An area of about 75,000 acres is now under fairly pure 1027 *A.L.F.* seed. The Goghari Cotton Control Act came into force in the district from the 25th April 1936

(2) *Baroda District*—Extension of *B 9* cotton in the district in areas where wilt was not much in evidence was in progress and the seed of *B 9* cotton supplied in the district amounted to 14,480 lbs sufficient to cover 1,448 acres

(3) *Mehsana District*—Attempts are being made to introduce *Wagad No 8* in place of local *Wagad* but lack of pure seed in sufficient quantity has hindered effective progress

(4) *Amreli District*—*Dhuka* cotton of which a good deal was hoped for on the basis of earlier trials on the farm has not, on the whole, come up to expectations. Its weakness lies in the marked tendency to shed its bolls heavily under certain moisture conditions in late September or early October. Some recovery of this loss is possible in irrigated areas but not when sown, as is most of the cotton, under dry conditions.

Some growers, however, continue to grow it on account of its higher ginning percentage. Trials of other types are being pushed forward. The correct solution is a cotton breeding station for Kathiawar and this, it is expected, will be brought into existence next year at Amreli in the Indian Central Cotton Committee's Dholleras Cotton Improvement Scheme

HYDERABAD STATE.—(1) *Garoni tract.*—423 071 lbs. of *Garoni* seed sufficient for an area of about 43 424 acres was purchased by the agricultural Department and distributed on Talari loan system to cultivators in the Nanded district. Seed of two selected superior strains of *Garoni* was distributed in selected villages amounting to 21 800 lbs. sufficient for about 14 9 acres.

(2) *Aerampahad District.*—Distribution of *Bonilla* seed was continued with a view to replace the inferior mixture now grown in the district. 115 000 lbs. of seed sufficient for about 7,200 acres were distributed by the Agricultural Department on Talari system.

(3) *Portlani District.*—Distribution of seed of *Terem 2A* was continued, with the object of replacing the present inferior variety. 40 000 lbs. of seed sufficient for about 2,600 acres were distributed by the Agricultural Department on Talari system.

(4) *Sachar District.*—Distribution of seed of improved varieties was continued, with a view to replace the local inferior types of *Kumysa* and mixed *Hispano-American*. Seed of *Jayram* variety amounting to 147 44 lbs. sufficient for about 18,747 acres and seed of *Osley No. 1* amounting to 37 134 lbs. sufficient for about 3 09 acres were distributed on Talari system.

APPENDIX X.

BALANCE SHEET AS AT 31st MARCH 1936

Receipts	Rs. a p	Rs. a p	Expenditure	Rs. a p	Rs. a p
Cotton Cess Receipts	16,16,181 13 1	1,05,24,795 6 8	<i>A Administration</i>		16,70,773 6 5
Interest received on investments			<i>B Improvement of Cotton Marketing—</i>		
Add—Refund of income tax deducted from interest	18,072 13 0		1 Cost of exhibits, moisture tests, etc.	88,977 5 5	
			2 Cost of growing cotton in India	1,95,140 12 6	
	16,34,254 10 1		<i>C Seed Distribution & Extension Schemes—</i>		2,84,118 1 11
Less—Interest paid in advance at the time of purchasing Government Paper (since re-covered) Interest on temporary overdraft and Bank's commission for collection of interest			(i) Bombay Presidency—		
Interest credited to Provident Fund account	56,347 9 2		(1) Hubli	42,524 13 10	
Bank's withdrawal charges for Securities sold	4,886 6 2		(2) Gadag	41,045 2 7	
Income tax on interest	4,227 11 0		(3) Gadag Supplementary	20,167 11 4	
Brokerage for securities sold	20,158 3 6		(4) Surat	46,431 10 4	
Provision for Sinking Fund	816 2 0		(5) Athani	18,925 15 8	
	7,035 0 0		(6) Khandesh	1,59,727 9 0	
			(7) Deccan Canals (Banilla)	3,721 12 7	
			(8) B D (8)	1,065 0 0	
			(iii) Madras—		
			(1) Pay and allowance of Business Manager, Tiruppur	18,610 3 9	
			(2) Co 2	25,762 3 2	
			(3) H1	3,952 2 9	
			(iii) Sind	1,90,666 0 11	
			(iv) Hyderabad	30,086 12 1	
			(v) Central Provinces—		
			Extension of long staple Cotton & marketing of Verum cotton	1,45,440 11 5	
			(vi) Baroda	5,755 12 5	
			(vii) Lyallpur ginneries	16,038 3 3	
			(viii) United Provinces C 402	6,660 0 0	
			Carried over		7,76,611 13 1
Profit on conversion and sale of Securities		15,40,783 10 3			
Sinking Fund account		2,50,459 10 2			
Miscellaneous Receipts		7,035 0 0			
Refund from Provident Fund account for contributions disallowed		40,802 6 5			
Suspense Receipts		3,391 1 11			
Less—Payment made					
	148 10 0				
	68 5 9				
Carried over		1,23,67,347 7 8			27,31,503 5 5

BALANCE SHEET AS AT 31st MARCH 1958—contd.

Return	Ru. A. P.	Expenditure	Ru. A. P.	Ru. A. P.
Drought fund	1,23,67,517 3 4			27,21,503 5 5
		D. Printing and Propaganda— (1) Policy and Programme (2) Printing and Distribution	85,417 8 5 41,238 8 0	1,23,879 1 5
		E. Statistical Research— (1) Studies of village communities and entire (2) Farm and Improvement Scheme	31,123 8 6 8,172 15 6	39,295 8 8
		II. Technical Research— 1. Technological Laboratory— A. Capital Expenditure— 1. Land and Buildings 2. Machinery 3. Furniture 4. Apparatus and Equipment 5. Machinery workshop B. Working Expenses 2. Fuel and 3. Depreciation of others three years provision estimate	6,04,298 7 0 9,199 8 10 7,552 2 4 41,594 3 7 2,178 8 5 18,84,082 8 5 81,523 7 5 223 7 11 2,49,034 8 8 49 12 0	23,31,099 11 8
		III. Research Scholarships Low-scholarship recovered from Mr. Tan- khar Ahmed		2,48,964 12 8
Carried over	1,23,67,517 3 4	Carried over		84,80,871 8 19

BALANCE SHEET AS AT 31st MARCH 1936—*contd*

Receipts	Rs	a. p	EXPENDITURE	Rs	a. p	Rs.	a. p
Brought forward	1,23,67,347	7 8	Brought forward			54,60,931	8 10
			AGRICULTURAL RESEARCH GRANTS—				
			IV <i>Bombay</i> —				
			1 A Surat Physiological	2,45,139	11 3		
			B " Writing up	5,814	7 8		
			2 A " Bollworm	1,14,509	9 7		
			B " Bollworm Propaganda	91,468	9 2		
			C " Bollworm Writing up	2,315	3 0		
			3 A Dharwar Wilt	1,82,886	4 11		
			B " Writing up	10,902	10 3		
			4 Khandesh	26,573	5 0		
			5 Co-ordination of Cotton Research	1,749	7 6		
			6 Jalgaon Cotton Breeding	31,116	6 3		
			7 Broach	36,988	0 11		
			8 Small Leaf Disease Survey	3,938	9 6		
			9 Survey of Goghan cotton in Bombay Presidency	1,380	0 0		
			10 Defibrating of cotton seed in Bombay Presidency	4,715	0 0		
			11 Plant Puller Propaganda	5,289	0 0		
			V <i>Madras</i> —				
			(a) Herbaceum	1,12,361	2 8		
			(b) Ferns and Physiological	86,014	1 1		
			(c) Fodder Cholam	14,565	10 10		
			(d) Nadam Cotton Breeding	7,018	2 5		
			VI <i>Punjab</i> —				
			(a) Botanical	4,73,058	15 4		
			(b) Entomological	1,88,843	10 1		
			(c) White Fly	46,671	3 2		
			(d) Root Rot	18,972	2 3		
			(e) Spraying Trials	10,812	11 3		
			(f) Defibrating and Delinting	6,872	10 0		
			(g) Survey of Disease of Malformation	1,730	10 6		
			(h) Physiological	32,867	8 0		
Carried over	1,23,67,347	7 8	Carried over	17,64,524	12 7	54,60,931	8 10

BALANCE SHEET AS AT 31st MARCH, 1936

Provident Fund Account

—	Rs. a p	Rs. a p	—	Rs. a p	Rs. a p
Subscribers' contributions %	1,96,693 8 1		By advances to subscribers	36,196 2 0	
Less—Payments made to subscribers resigned	45,952 13 4		Less—Recoveries made upto 31st March 1936	32,617 10 0	
Committee's contributions %	1,92,383 3 6	1,50,740 10 9	Accrued interest on Government Paper upto 31st March 1936, credited to subscribers for distribution		3,578 8 0
Less—Payments made to subscribers resigned and forfeitures for contributions disallowed	43,657 5 2	1,48,725 14 4	By Balance		3,424 8 4
Suspense Deposit of Mr Dutt for his own contributions	1,046 4 10				3,34,381 4 4
Suspense amount due to Peon Durbara Singh resigned	23 0 4				
Investment Fluctuations %		1,069 5 2			
Lapse and Forfeiture %		38,976 7 5			
		1,871 15 0			
Total		3,41,384 4 8	Total		3,41,384 4 8

PROVIDENT FUND ACCOUNT AS AT 31ST MARCH 1936

[illegible]

Examined and found correct

BOMBAY, 16th June 1936

(Sd) S B BILLIMORIA & Co.,
Registered Accountants, Auditors

STATEMENT SHOWING EXPENDITURES UNDER PAYMENT AND DEBT EXTENSION ACTS FROM JANUARY 1914 TO JANUARY 1916

[illegible]

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1936—contd

Major Heads	Total sanctioned grant	Period	Date of starting of the scheme	Total expenditure upto 31st March 1936	Expenditure from Capital Grants on		Expenditure from annual grants on staff, field experiments, stores, laboratory and field contingencies including petty apparatus	Net working expenses, staff, field experiments, stores, laboratory and field contingencies including petty apparatus	REMARKS
					(a) Lands and Buildings	(b) Machinery, apparatus and other movable property			
1	2	3	4	5	6	7	8	9	10
AGRICULTURAL RESEARCH GRANTS— (continued)									
IV <i>Madras Schemes—(contd)</i>									
(6) Jilron Cotton Breeding	Rs a p 41,111 0 0	Yrs Mths 5 0	1st April 1932	Rs a p 31,116 6 3	Rs a p	Rs a p	Rs a p 3,171 8 9	Rs a p 27,944 13 6	
(7) Co-ordination of Cotton Research	23,991 0 0		Not to start	1,749 7 6				1,749 7 6	
(8) Survey of Small Leaf Disease of cotton	5,118 0 0	1 0	6th Nov 1933	3,938 9 6			495 2 6	3,443 7 0	Scheme closed down on 31st October 1934
(9) Survey of Goshari cotton in Gujarat	5,000 0 0	5 0	16th Jan 1935	1,380 0 0				1,380 0 0	
(10) Dehydration of cotton seed — Recurring	5,250 0 0	3 0	1st Feb 1936	4,715 0 0		3,700 0 0		*1,015 0 0	*Provisional figures
Non recurring	3,700 0 0								
V <i>Madras Schemes—</i>									
(1) Ichikium	1,47,068 0 0	14 6	Dec 1923	1,12,361 2 8			*4,420 10 3	*1,07,940 8 5*	Do do
(2) Pempheres and Physiological	2,12,779 0 0	7 0	16th Sept. 1931	86,014 1 1			6,891 5 10	79,122 11 3	
(3) Fedder Cholam —	900 0 0	6 5	14th Jan 1931	14,565 10 10		881 11 7	331 11 6	13,352 3 9	
(a) Capital	21,010 0 0								
(b) Recurring	13,730 0 0	5 0	14th June 1933	7,018 2 5			404 0 0	6,614 2 5	
(4) Nadam Cotton Breeding									
	31,330 0 0	14 7½	13th August 1925	4,73,058 15 4	22,158 0 0	9,102 11 0	34,516 1 4	4,07,282 3 0	† Rs 2,030 transferred to Capital from working grant.
(a) Capital Expenditure	† 6,85,650 0 0								
(b) Working Expenses									
(2) Entomological —									
(a) Capital Expenditure	6,000 0 0	10 11	4th May 1926	1,38,843 10 1		5,828 3 10	9,695 15 8	1,73,321 6 7	
(b) Working Expenses (Pink and Spotted Boll worms)	2,40,410 0 0								
(3) White Fly	56,087 0 0	5 5	1st May 1931	46,671 3 2			9,336 2 2	37,335 1 0	Scheme closed down on 30th September 1936

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1936—contd

Major Heads	Total functional grant	Period.	Date of starting of the scheme	Total expenditure upto 31st March 1936	Expenditure from Capital Grants on			Expenditure from annual grants on staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus	Net working expenses, i.e. salaries, field experiments, labour, stores, laboratory and field contingencies including petty apparatus	REMARKS
					(a) Lands and Buildings	(b) Machinery, apparatus and other movable property	(c)			
1	2	3	4	5	6	7	8	9	10	
RESEARCH SCHEMES—contd.										
XI <i>Bursera</i> — (1) Capital Expenditure (2) Current Expenditure	Rs. a p. 3 000 0 0 49,032 0 0	Yes Mths 6 0	1st April 1931	Rs. r p. 2,906 15 5 37,602 7 9	Rs. r p. 2,906 15 5		Rs. r p. 4,097 8 0	Rs. a p. 33,504 15 9		
XII <i>Hydrabad</i> — (1) <i>Beta Vulgaris</i> (2) <i>Cotton</i> <i>Sisum</i> (3) Pink and Spotted Bellworn	3 50 617 0 0 79,165 0 0 52,025 0 0 43,580 0 0	9 11 5 0 3 4 2 0	10th May 1929 28th June 1931 1st June 1933	2,04,383 7 4 33,871 0 4 31,187 7 0			17,461 15 10 263 11 5 580 4 3	1,86,921 7 6 33,607 4 11 30,607 2 9		Scheme closed down on 27th June 1936 *Subject to the Government of India's sanction and acceptance of certain conditions by the Hyderabad State
XIII <i>Bikaner</i> —Bengal Cotton Improvement— (1) Capital Expenditure (2) Working Expenses XIV <i>Baroda</i> — (1) Root Rot— (2) Comparative tests of 1027 and 14 cottons	14 500 0 0 65,370 0 0 4,000 0 0 54,179 0 0 37,390 0 0 4 250 0 0	10 0 5 0 5 4 1 2	1st Jan 1931 1st Feb 1932 15th April 1932	37,593 10 4 47,395 5 5 4,251 5 3	8,584 6 9 4,000 0 0	3,735 1 9	242 8 6 3,899 7 7 145 11 6	25,031 9 4 39,496 1 10 4,105 9 9		
(3) Survey of Godhara cotton (4) First Puller Preparation XV <i>Bengal</i> <i>Comilla</i> Cotton XVI <i>Gyrene</i> (Dolabathi) Cotton XVII <i>Collection of Herbaceum</i> cotton in Iran	5 000 0 0 9 250 0 0 18,510 0 0 9,442 0 0 4 000 0 0	5 0 2 0 5 0 3 0	1st Feb 1935 1st Jan 1936 1st Dec. 1934 1st Nov 1935 31st Aug 1936	1,500 0 0 2,347 8 0 5,147 2 0 988 0 0			402 15 10	1,500 0 0 2,347 8 0 4,744 2 2 988 0 0		**Subject to the sanction of the Government of India Scheme closed down on 15th June 1933

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SP'D EXTENSION SCHEMES UPTO 31st MARCH 1926—contd

[illegible]

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1938—*concd*

MAJOR HEADS	2	3	4	5	Expenditure from Capital Grants on		8	9	10	REMARKS		
					(a) Lands and Buildings	(b) Machinery, apparatus and other movable property						
	Rs	a. p.		Rs	a. p.	Rs	a. p.	Rs	a. p.			
2. Madras— (i) Pay and Allowances of Business Manager, Tiruppur	21,050	0 0	5 years	18,640	3 9			148	8 0	18,491	11 9	Provisionally extended up to 14th September 1937
(ii) Co. 2	81,310	0 0	5 "	25,762	3 2			83	13 0	25,678	6 2	(b) Scheme closed down on 16th July 1934
(iii) H 1	18,860	0 0	2 "	3,952	2 9					3,952	2 9	
Punjab-Lyallpur Ginnery	18,125	0 0	8 years	16,038	3 3					1,84,885	13 2	Extension from 1st September 1936, to 28th February 1941 subject to the acceptance of the Committee's condition by the Hyderabad Government.
Sind	3,89,540	0 0	6 "	1,90,666	0 11	9,221	5 0	5,780	3 9	30,086	12 1	
Hyderabad	35,466	0 0	& 6 months	30,086	12 1							
	1,17,900	0 0	3 years & 8 months.	73,544	2 5					73,544	2 5	Scheme closed down on 30th April 1934
Central Provinces— (1) Verum cotton												
(2) Extension of Long Staple cotton and Marketing of Verum cotton.	1,25,528	0 0	3 years	71,896	9 0					71,896	9 0	*Provisional figures
Baroda	25,600	0 0	5 "	5,755	12 5			*217	8 0	5,538	4 5	
United Provinces C402	45,800	0 0	5 "	6,660	0 0			300	0 0	6,360	0 0	

APPENDIX VI

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS

(Based on Returns made under the Indian Cotton Cess Act 1902, by Mills in British India, and on Voluntary Returns from Mills in Indian States.)

Cotton Year 1st September to 31st August.

(In Balas of 400 lbs. Net.)

	1923-24	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Bombay Island	762,610	867,653	731,827	717,996	433,678	642,006	796,373	664,644	611,606	663,664	491,276	677,277	664,196
Alamabad	263,745	273,636	256,600	264,136	256,073	316,963	316,021	321,970	322,337	346,679	373,343	326,319	320,962
Bombay Presidency	1,160,416	1,424,447	1,196,636	1,167,632	664,671	1,644,923	1,260,639	1,175,636	1,125,643	1,116,277	1,033,349	1,220,616	1,179,316
Madras Presidency	1,66,721	162,676	176,374	183,207	164,661	764,364	311,636	316,796	296,207	292,613	276,096	312,164	265,623
United Provinces	160,622	177,664	191,760	204,702	176,646	125,462	254,203	233,623	236,629	273,673	277,256	272,674	317,611
Central Provinces and Berar	64,616	106,632	106,665	111,231	116,666	131,261	123,146	116,692	111,616	111,206	112,666	123,614	120,296
Bengal	72,623	83,633	77,646	66,667	82,696	64,312	66,673	91,663	102,660	102,264	107,633	101,161	66,662
The Punjab and Delhi	23,666	30,663	33,664	46,667	43,633	54,673	64,664	73,296	66,661	60,634	71,636	63,667	66,630
Rest of British India	12,227	14,616	17,316	13,160	18,046	23,166	24,436	27,101	26,242	31,633	33,126	26,373	26,610
Total—British India	1,663,636	1,666,066	1,706,204	1,616,723	1,616,760	1,716,023	2,637,693	1,833,363	1,667,603	2,076,664	1,644,310	2,163,271	2,226,374
Total—Indian States*	142,603	176,066	167,614	229,443	231,666	277,646	316,399	333,666	333,293	341,270	360,116	426,341	466,196
Total—India	1,806,639	1,842,676	1,863,616	1,842,379	1,848,349	1,993,676	2,273,664	2,266,359	2,000,896	2,416,934	2,004,426	2,612,122	2,692,570

* Figures for Indian States up to and including 1930-31, being based on yarn production returns, include foreign cotton also.

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States)

Cotton Year 1st September to 31st August

(In Bales of 400 lbs. Nett)

	1928-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488	33,231	45,588	51,771
Mysore	43,571	44,320	39,619	46,590	43,326	49,293	50,596	47,168	51,196	50,708
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587	53,612	57,146	51,863
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306	49,362	56,318	72,163
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,038	111,430	114,229	113,379
Kathlawar States	}	}	}	{	{	18,849	18,868	26,506	35,439	37,397
Other Indian States						39,982	40,269	45,197	45,735	51,482
Pondicherry						20,257	23,170	23,610	22,691	20,355
Total Indian States	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341	449,198

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA

(Based on Voluntary Returns furnished by Mills)

Cotton Year 1st September to 31st August

(In Bales of 400 lbs Nett)

	1928-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36
Bombay Presidency	28,328	24,970	27,324	24,361	54,409	74,979	80,092	74,868	58,355	75,617
Madras Presidency	35,198	39,560	52,188	46,582	55,717	99,389	96,340	110,875	123,260	147,044
United Provinces	16,991	10,308	13,878	20,441	18,496	14,367	19,236	17,871	10,090	10,405
Central Provinces and Berar	40,762	20,661	6,924	16,243	15,771	20,743	17,462	18,382	20,544	27,502
The Punjab	3,910	4,739	3,760	4,361	4,307	2,317	2,149		5,535	3,110
Total	125,189	100,438	104,074	111,988	148,700	211,795	215,279	221,998	217,784	263,678

APPENDIX XII

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS
AND THE TRADE ON 31st AUGUST 1935 AND 1936

(In thousand bales* of 400 lbs. each.)

Trade Descriptions of Cotton.	TRADE STOCKS ON 31st AUGUST								MILL STOCKS ON 31st August.		Total Indian Trade and Mill Stocks on 31st AUG.	
	Bombay Island.		Karachi		Rest of India.		Total India		Total India.		1935.	1936.
	1935	1936	1935	1936	1935	1936	1935.	1936	1935	1936		
BARODA—												
United Provinces	—	—	—	—	(1) 9	(1) 4	4	4	22	16	22	20
Parish	—	—	27	16	(1) 4	(1) 2	41	34	6	12	39	35
Sul	—	—	14	6	—	(1) 2	14	6	6	6	17	11
R. Spinning	—	—	—	2	(1) 1	—	2	2	12	15	17	17
Others (Unclassified)	61	16	—	—	(1) 1	—	62	16	5	1	60	20
Total	61	16	41	27	15	11	123	57	52	47	174	104
COCHIN—												
Central Provinces & Berar	16	10	—	—	(1) 13	(1) 14	24	16	22	17	26	23
Barar Owners	24	6	—	—	(1) 14	(1) 12	38	16	11	6	49	27
Khandesh—Baroda	—	—	—	—	—	—	—	—	12	7	12	7
Khandesh Owners	16	16	—	—	(1) 4	(1) 2	23	12	12	6	25	16
Central India—M. & C.	14	12	—	—	(1) 4	(1) 11	16	24	16	24	16	24
Central India—Others	14	6	—	—	(1) 4	(1) 27	16	23	11	10	25	28
Rail and Major Owners	—	—	—	—	—	—	—	—	—	—	29	23
Total	90	47	—	—	31	50	151	102	110	68	231	133
HYDRABAD—												
HYDRABAD & GAWANI	—	—	—	—	(1) 10	(1) 4	10	4	6	12	6	12
Total	—	—	—	—	10	4	14	4	12	12	12	12
AMERICAN—												
Parish—225-P (all New Types)	—	26	—	—	—	(1) 1	—	26	6	16	6	45
Parish—225-P (all P. & P.)	15	7	29	—	(1) 23	(1) 16	73	61	44	29	118	170
Parish—225-P (all P. & P.)	—	24	7	12	—	—	7	42	10	12	17	57
Parish—225-P (all P. & P.)	17	3	4	23	—	(1) 1	21	31	16	13	40	46
Dharwar (Gawani)	—	—	—	—	—	—	—	—	6	6	6	6
Dharwar (Upland—Unclassified)	—	—	—	—	—	—	—	—	1	7	1	7
Cambridge (Columbiana)	—	—	—	—	—	—	—	—	—	—	—	—
Cambridge (No. 2)	6	6	—	—	—	—	—	—	61	52	61	62
Cambridge (Unclassified)	—	—	—	—	—	—	—	—	25	24	44	46
Total	39	67	30	116	23	12	115	199	192	143	234	434
B. & C.—												
B. & C. (Baroda)	6	61	—	—	—	—	6	61	26	45	24	103
B. & C. (Unclassified)	22	116	—	—	(1) 6	—	23	116	30	43	58	161
Total	30	179	—	—	6	—	36	179	56	88	82	264
DECCAN—												
Madhya	16	2	—	—	—	—	16	2	6	4	23	6
Coch	—	—	—	—	—	—	—	—	—	—	—	—
Ward	—	—	—	—	—	—	—	—	23	28	23	23
Dharwar (Unclassified)	27	145	—	—	(1) 7	(1) 6	34	149	10	6	44	153
Total	43	147	—	—	7	6	52	151	49	38	101	189
SOUTHERN—												
Kanpur (all raws)	—	—	—	—	—	—	—	—	20	29	20	29
Kanpur (Unclassified)	—	—	—	—	—	—	—	—	21	46	51	77
Ward (Jowari and Mungari)	23	45	—	—	(1) 9	(1) 8	34	100	42	52	104	179
Northward	—	—	—	—	(1) 14	(1) 20	14	20	5	6	16	25
Cochin (A. Ward)	—	—	—	—	—	—	—	—	20	16	20	16
Kanpur (all raws)	—	—	—	—	—	—	—	—	24	40	30	41
Timor (all raws)	—	—	—	—	—	—	—	—	5	2	2	2
Unclassified	14	—	—	—	—	—	14	—	—	—	1	—
Total	43	74	—	—	29	28	68	149	123	234	276	373
COMBLES												
Baroda (Ward & Ward)	1	—	—	—	—	—	1	—	1	—	2	—
Others (Unclassified)	10	4	—	—	—	—	16	4	—	2	10	2
Total Indian Cotton	322	535	92	137	118	186	523	832	700	794	1,232	1,632

*Standard Indian bales of approximate average gross weight 400 lbs. and net weight 362 lbs. of cleaned (51st) cotton.

N.B.—Detailed Statement of Mill Stocks on the 31st August 1936 is attached.

- (1) At Cawnpore.
 (2) In the Parish.
 (3) At Ahmedabad.
 (4) In the Central Provinces.
 (5) In Barar.
 (6) 1 East and West: Khandesh Districts.
 (7) 1 Indore and Gwalior States.
 (8) In Hyderabad State.
 (9) In the Madras Presidency.
 Includes 622 bales held at Ahmedabad.
 Includes 608 bales held at Ahmedabad.
 Includes 2,006 bales held in Hyderabad State.

STOCKS OF RAW COTTON HELD BY THE

(Compiled from Voluntary

(In thousand bales*)

Trade Descriptions of Cotton	Bombay Island	Ahmed abad	Rest of Bombay Presidency	Total Bombay Presidency	Madras North	Madras South	Total Madras Presidency	United Provinces	Central Provinces	Berar	Total C.P. and Berar	Bengal
BENGALS—												
United Provinces	1	—	—	1	—	—	—	8	—	—	—	2
Punjab	2	—	—	2	—	—	—	1	—	—	—	—
Sind	—	1	—	1	—	—	—	—	—	—	—	—
Rajputana	3	—	—	3	—	—	—	—	—	—	—	1
Others	1	—	—	1	—	—	—	—	—	—	—	—
Total	7	1	—	8	—	—	—	9	—	—	—	3
OOMRAS—												
Central Provinces Oomras	1	—	—	1	—	—	—	—	14	1	15	1
Berar Oomras	2	—	—	2	—	—	—	—	5	2	7	—
Khandesh—Banilla	1	—	5	6	—	—	—	—	1	—	1	—
Khandesh Oomras	1	—	5	6	—	—	—	—	—	—	—	—
Central India—Malvi	2	2	—	4	—	—	—	—	—	—	—	—
Central India—Others	5	—	2	7	—	—	—	1	—	—	—	—
Barsi and Nagar Oomras	1	—	4	5	—	—	—	—	—	—	—	—
Total	13	2	16	31	—	—	—	1	20	3	23	1
VERUM 282	1	—	—	1	—	—	—	—	8	3	11	—
HYDERABAD GAORANI	5	—	22	27	3	—	3	—	10	1	11	—
Total	6	—	22	28	3	—	3	—	18	4	22	—
AMERICANS—												
Punjab—(289-F and New Types)	9	1	—	10	2	1	3	—	—	—	—	3
Punjab (Unspecified 4 F)	19	—	—	19	—	16	16	24	1	—	1	8
Sind—289 F & F-1	10	3	—	13	2	—	2	—	—	—	—	—
Sind (Unspecified—4-F)	6	2	—	8	—	8	8	—	—	—	—	1
Dharwar (Gadag 1)	4	—	—	4	—	—	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	4	—	1	5	—	—	—	—	—	1	1	—
Cambodia (Coimbatore No 2)	—	—	1	1	1	55	56	—	—	1	1	2
Cambodia (Unspecified)	10	—	1	11	1	21	22	—	—	—	—	1
Total	62	6	3	71	6	101	107	24	1	2	3	15
BROACH—												
Surat-Navsari (Snrtl)	14	18	3	35	—	—	—	—	1	—	1	1
Broach (Unspecified)	22	15	1	38	—	1	1	—	—	—	—	1
Total	36	33	4	73	—	1	1	—	1	—	1	2
DHOLLERAS—												
Mattheo	3	—	—	3	—	—	—	—	—	—	—	—
Cutch	—	—	—	—	—	—	—	—	—	—	—	—
Wagad	1	21	—	22	—	—	—	—	—	—	—	—
Dhollerias (Unspecified)	4	2	—	6	—	—	—	—	—	—	—	—
Total	8	23	—	31	—	—	—	—	—	—	—	—
SOUTHERNS—												
Kumptas (Jayawant)	17	1	5	23	6	—	6	—	—	—	—	—
Kumptas (Unspecified)	17	—	10	27	5	—	5	—	—	—	—	—
Westerns (Jowari and Mungari)	12	1	13	26	9	1	10	—	—	—	—	1
Northerns	1	—	—	1	18	1	19	—	—	—	—	—
Coconadas (& Warangal)	—	—	2	2	1	—	1	—	—	—	—	1
Karunganni	—	—	—	—	—	18	18	—	—	—	—	1
Tinnevelles	1	—	—	1	—	39	39	—	—	—	—	—
Salems	—	—	—	—	—	2	2	—	—	—	—	—
Total	48	2	30	80	39	61	100	—	—	—	—	3
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi)	—	—	—	—	—	—	—	—	—	—	—	1
OTHER SORTS	—	—	—	—	—	—	—	—	—	—	—	—
Total Indian Cotton	180	67	75	322	48	163	211	34	40	9	49	25
AMERICANS	10	—	—	10	—	—	—	—	—	—	—	—
EGYPTIANS	4	7	1	12	1	1	2	—	—	—	—	1
EAST AFRICANS	19	12	4	35	—	2	2	—	1	—	1	2
OTHERS (Sudan, Mesopotamia, etc.)	4	1	1	6	—	—	—	—	—	—	—	—
Total Foreign Cotton	37	20	6	63	1	3	4	—	1	—	1	3
GRAND TOTAL	217	87	81	385	49	166	215	34	41	9	50	28

*Standard Indian bales of approximate average gross weight 400 lbs

MILLS IN INDIA ON 31st AUGUST 1936.

Returns furnished by Mills.)

of 400 lbs. each.)

Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Bombay.	Gwalior.	Indore.	Kathiawar State.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Description Cotton.
4	—	19	—	—	—	—	—	—	—	—	1	16	Byrals—
—	—	12	—	—	—	—	—	—	—	—	—	12	United Provinces
—	19	14	—	—	—	—	—	—	—	—	—	19	Punjab
—	—	1	—	—	—	—	—	—	—	—	—	1	Sind
—	—	—	—	—	—	—	—	—	—	—	—	—	Rajputana
—	—	—	—	—	—	—	—	—	—	—	—	—	Others
7	19	43	—	2	—	1	—	—	1	—	4	47	Total
—	—	17	—	—	—	—	—	—	—	—	—	17	Oomras—
—	—	9	—	—	—	—	—	—	—	—	—	9	Central Provinces Oomras
—	—	7	—	—	—	—	—	—	—	—	—	7	Berar Oomras
—	—	6	—	—	—	—	—	—	—	—	—	6	Khandesh—Bambra
—	—	4	—	—	—	—	—	—	—	—	—	4	Khandesh Oomras
—	—	3	1	—	—	—	17	—	2	—	20	34	Central India—Malvi
—	—	6	—	—	—	—	1	—	—	—	2	10	Central India—Others
—	—	—	—	—	—	—	—	—	—	—	—	—	Bard and Nagar Oomras
—	—	64	1	—	1	3	18	—	2	—	22	23	Total
—	—	12	—	—	—	—	—	—	—	—	—	12	VENUS 202
—	—	41	3	—	—	—	—	—	—	—	—	44	HYDERABAD GACRA 1
—	—	23	3	—	—	—	—	—	—	—	—	26	Total
—	—	16	—	—	—	—	—	—	—	—	—	16	AMERICANS—
—	—	23	—	—	—	—	—	—	—	—	—	23	Punjab—(200-F and New Types)
—	—	17	—	—	—	—	—	—	—	—	—	17	Punjab (Unspecified—4-F)
—	—	4	—	—	—	—	—	—	—	—	—	4	Sind—200-F & F 1
—	—	—	—	—	—	—	—	—	—	—	—	—	Sind (Unspecified—4-F)
—	—	3	—	—	—	—	—	—	—	—	—	3	Dharwar (Gadag 1)
—	—	—	—	—	—	—	—	—	—	—	—	—	Dharwar (Upland—Unspecified)
—	—	60	—	—	—	—	—	—	—	—	—	60	Cambodia—Columbiana
—	—	24	—	—	—	—	—	—	—	—	—	24	N. S.
—	—	—	—	—	—	—	—	—	—	—	—	—	Cambodia (Unspecified)
19	3	235	—	3	—	1	—	—	2	2	10	248	Total
—	—	37	—	—	—	—	—	—	—	—	—	37	BRONCHES—
—	—	49	—	—	—	—	—	—	—	—	—	49	Southern (Sert)
—	—	—	—	—	—	—	—	—	—	—	—	—	Branch (Unspecified)
—	—	77	—	—	—	—	—	—	—	—	—	77	Total
—	—	3	—	—	—	—	—	—	—	—	—	3	DESHMUKH—
—	—	23	—	—	—	—	—	—	—	—	—	23	Mattho
—	—	3	—	—	—	—	—	—	—	—	—	3	Cutch
—	—	—	—	—	—	—	—	—	—	—	—	—	Ward
—	—	31	—	—	—	—	—	—	—	—	—	31	Dhokera (Unspecified)
—	—	—	—	—	—	—	—	—	—	—	—	—	Total
—	—	29	—	—	—	—	—	—	—	—	—	29	SOUTHERNS—
—	—	32	—	14	—	—	—	—	—	—	—	46	Karnataka (J. yawan)
—	—	—	—	—	—	—	—	—	—	—	—	—	Karnataka (Unspecified)
—	—	37	1	13	—	—	—	—	—	—	—	50	Western (Jowari and Maungari)
—	—	20	—	—	—	—	—	—	—	—	—	20	Northern
—	—	4	1	—	—	—	—	—	—	—	—	5	Coorwada (& Warrangal)
—	—	13	—	—	—	—	—	—	—	—	—	13	Karavalli
—	—	40	—	—	—	—	—	—	—	—	—	40	Tinnevelly
—	—	3	—	—	—	—	—	—	—	—	—	3	Salma
—	—	123	3	23	—	—	—	—	—	—	—	146	Total
—	—	—	—	—	—	—	—	—	—	—	—	—	COTTONS
—	—	—	—	—	—	—	—	—	—	—	—	—	Byrals (Wagale & Wagyl)
—	—	—	—	—	—	—	—	—	—	—	—	—	Other Sorts
12	31	431	12	43	4	11	20	3	3	7	113	794	Total India Cotton
—	—	10	—	—	—	—	—	—	—	—	—	10	AMERICANS
—	—	13	—	—	—	—	—	—	—	—	—	13	EGYPTIANS
—	—	40	—	—	—	—	—	—	—	—	—	40	EAST AFRICANS
—	—	3	—	—	—	—	—	—	—	—	—	3	OTHERS (Sudan, Mesopotamia etc.)
—	—	71	—	—	—	—	—	—	—	—	—	71	Total Foreign Cotton
12	31	722	12	43	4	11	20	3	3	7	121	913	GRAND TOTAL

net wet weight 202 lbs. of cleaned (Net) cotton.

STOCKS ON 31st JANUARY, 1935 AND 1936 OF "TINNEVELLIES," "SALEMS"
AND "CAMBODIAS" HELD BY THE MILLS AND THE TRADE
IN THE MADRAS PRESIDENCY

(In thousand bales of 400 lbs net)

TRADE DESCRIPTIONS OF COTTON	Mill stocks on 31st January		Trade stocks on 31st January		Total stocks on 31st January.	
	1935	1936	1935.	1936	1935	1936
Tinnevelles	21	14	7	12	28	26
Salems	10	6	2	3	12	9
Cambodias ..	42	41	11	22	53	63
Total	73	61	20	37	93	98

APPENDIX VIII

EXPORTS BY SEA OF INDIAN RAW COTTON CLASSIFIED BY VARIETIES.

(Compiled from Voluntary Returns furnished by Exporters.)

1st September 1935 to 31st August 1936.

(In thousand bales of 400 lbs. each.)

Trade Descriptions of Cotton	Exported to				Total Exports.
	Europe (including United Kingdom) and the West.	United Kingdom.	Japan.	China and the East (including Japan)	
INDIANS—					
United Provinces	20	8	28	2	58
Punjab	310	73	223	16	622
Sind	120	40	37	1	208
Rajputana	9	—	8	—	24
Others	3	4	27	—	34
Total	462	125	323	19	929
OMRAS—					
Central Provinces—Omras	48	36	85	1	170
Berar—Omras	27	13	204	4	256
Khandesh—Banilla	1	—	16	—	17
Khandesh—Omras	33	—	176	10	219
Central India—Malvi	4	—	14	—	18
Central India—Others	20	1	122	38	171
Barsi and Napor—Omras	10	1	83	14	76
Unclassified	24	8	108	—	135
Total	177	59	724	67	1,027
VERM 202	—	—	—	—	—
HYDERABAD (GACHANI)	1	—	8	—	7
Total	1	—	8	—	7
AMERICANS—					
Punjab—202 F	3	1	1	—	6
Punjab (Unspecified—4 F)	184	159	359	17	699
Sind—202 F & 1 I	2	3	—	2	7
Sind (Unspecified—4 F)	9	30	30	—	69
Dharwar (Gadag 1)	1	—	1	—	2
Dharwar (Upland—Unspecified)	—	—	10	—	10
Cambodia (Colmatore No. 2)	2	—	18	1	21
Cambodia (Unspecified)	7	8	11	—	23
Total	199	199	430	20	826
BROACH—					
Bural Navaari (Burti)	10	2	18	—	30
Broach (Unspecified)	43	18	63	11	134
Total	53	20	81	11	164
DHOLLERAS—					
Matheo	51	—	32	3	86
Outch	—	—	7	—	7
Wagad	—	—	1	—	1
Dhollerias (Unspecified)	3	—	73	6	83
Total	54	—	113	9	176
SOUTHERNS—					
Kumptas (Jayawant)	—	—	—	—	—
Kumptas (Unspecified)	—	—	—	—	—
Westerns (Jowari and Mungari)	18	—	48	3	66
Northerns	12	—	8	—	20
Coonadas (and Warangal)	18	13	—	—	31
Karunganni	5	1	3	—	9
Tinnevellee	8	4	42	—	55
Ralems	1	1	—	—	2
Total	64	19	98	3	183
COMILLAS	53	11	8	1	69
BURMAS (Wagale and Wagyi)	1	2	6	—	9
OTHER SORTS (Unclassified)	4	1	3	5	13
GRAND TOTAL	965	429	1,838	124	3,356
Total exports, as per official returns, from British Indian and Kathiawar Ports—Bales of 400 lbs. net	1,097	532	2,062	134	3,826

APPENDIX

RECEIPTS AT MILLS IN INDIA OF

(Compiled from returns
1st September 1935 to
(In thousand bales*)

Trade Descriptions of Cotton	Bombay Island	Ahmed abad	Rest of Bombay Presidency	Total Bombay Presidency	Madras Presidency	United Provinces	C P & Berar	Bengal	Punjab and Delhi	Rest of British India
BENGALS—										
United Provinces	11	—	1	12	—	92	1	12	28	—
Punjab	19	1	2	22	—	6	—	1	16	2
Sind	6	3	—	9	1	—	—	—	—	—
Rajputana	16	1	—	17	—	2	—	—	—	18
Others	8	—	—	8	—	—	—	—	—	—
Total	60	5	3	68	1	100	1	13	44	20
OOMRAS—										
Central Provinces Oomras	23	—	—	23	—	3	53	10	—	—
Berar Oomras	22	1	1	24	—	3	31	2	—	—
Khandesh—Banilla	5	—	18	23	—	—	1	—	—	—
Khandesh Oomras	19	1	15	35	—	—	1	—	—	—
Central India—Malvi	10	13	—	23	—	4	—	—	—	—
Central India—Others	36	3	3	42	—	12	—	2	—	—
Barsi and Nagar Oomras	7	—	19	26	—	—	—	—	—	—
Total	122	18	56	196	—	22	86	14	—	—
VERUM 262	4	1	1	6	—	—	23	—	—	—
HYDERABAD GAORANI	20	—	37	57	—	—	15	—	—	—
Total	24	1	38	63	—	—	38	—	—	—
AMERICANS—										
Punjab—289 F (and New Types)	26	5	1	32	8	1	—	6	13	—
Punjab (Unspecified—4 F)	79	2	1	82	38	86	4	35	35	6
Sind Sudhar (289 F and F—1)	41	16	1	58	2	—	—	1	—	—
Sind (Unspecified—4-F)	44	11	2	57	30	—	—	2	—	—
Dharwar (Gadag 1)	5	—	1	6	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	9	1	3	13	—	—	—	—	—	—
Cambodia (Coimbatore No 2)	4	1	2	7	110	—	1	2	—	—
Cambodia (Unspecified)	12	2	2	16	54	—	2	5	—	—
Total	220	38	13	271	242	87	7	51	48	6
BROACH—										
Surat Navsari (Surti)	36	63	7	106	—	—	1	1	—	—
Broach (Unspecified)	76	50	3	129	1	—	—	2	—	—
Total	112	113	10	235	1	—	1	3	—	—
DHOLLERAS—										
Mattheo	18	1	—	19	—	—	—	—	—	—
Cutch	1	—	—	1	—	—	—	—	—	—
Wagad	6	98	8	105	—	—	—	—	—	—
Dholleras (Unspecified)	16	10	1	27	—	—	—	—	—	—
Total	41	107	4	152	—	—	—	—	—	—
SOUTHERNS—										
Kumptas (Jayawant)	31	2	8	41	6	—	—	1	—	—
Kumptas (Unspecified)	34	1	20	55	1	—	—	1	—	—
Westerns (Jowari and Mungari)	37	3	35	75	20	—	—	3	—	—
Northern	2	—	—	2	12	—	—	—	—	—
Coconadas (and Warangal)	1	—	2	3	4	—	—	4	—	—
Karunganni	1	—	—	1	47	—	—	2	—	—
Tinnevellies	3	—	1	4	64	—	—	1	—	—
Salems	—	—	—	—	5	—	—	—	—	—
Total	109	6	66	181	159	—	—	12	—	—
COMILLAS	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale and Wagyl)	—	—	—	—	—	—	—	2	—	9
OTHER SORTS	1	—	1	2	3	—	—	1	—	—
Total Indian Cotton	669	288	191	1,168	406	209	133	96	92	35
AMERICANS	21	2	—	23	—	—	—	1	—	—
EGYPTIANS	21	32	1	54	5	—	—	2	1	—
EAST AFRICANS	86	100	12	198	4	—	—	9	2	—
OTHERS (Sudan, Mesopotamia, etc.)	13	5	3	21	—	—	—	1	—	—
Total Foreign Cotton	141	139	16	296	9	—	—	13	3	—
GRAND TOTAL	830	427	207	1,464	415	209	133	109	95	35
Indian raw cotton consumed in mills in India (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lbs net)	664	321	204	1,189	365	317	130	99	90	36

* Standard Indian bales of approximate average

XIV.

RAW COTTON CLASSIFIED BY VARIETIES

furnished by Mills.)

31st August 1936.

of 400 lbs. each)

Total India Mills	Hydr- abad.	Mysoor.	Daroda	Gwalior	Indore.	Kachnar State.	Other India States.	Poon- cherry	Total India Mills	Grand Total.	Trade Descriptions of Cotton.
145	—	—	—	13	—	—	4	—	17	182	INDIANS—
47	—	5	—	—	—	—	1	—	6	50	United Provinces
18	—	—	—	—	—	—	—	—	18	36	Punjab
57	—	—	—	1	2	1	—	—	18	49	Sind
5	—	—	—	—	—	—	—	—	—	5	Rajputana
—	—	—	—	—	—	—	—	—	—	—	Others
247	—	5	—	14	2	1	13	—	53	282	Total
89	—	—	—	—	—	—	2	1	9	92	OTHERS—
80	—	—	—	—	—	—	1	—	1	81	Central Provinces Oomras
54	—	—	—	—	—	—	—	—	—	54	Berar Oomras
36	—	—	—	—	—	—	—	—	—	36	Khandesh—Banilla
37	—	—	7	24	66	—	10	—	106	196	Khandesh Oomras
54	1	—	—	1	13	—	5	—	31	87	Central India—Malvi
28	—	—	—	—	—	—	—	—	—	28	Central India—Others
—	—	—	—	—	—	—	—	—	—	—	Bani and Nagar Oomras
818	1	—	7	53	84	—	18	1	174	492	Total
23	—	—	1	—	—	—	—	—	1	24	VERUM 203
73	23	—	—	—	—	—	—	—	23	96	(HYDERABAD GAOHAN)
101	23	—	1	—	—	—	—	—	54	123	Total
80	—	—	1	1	—	—	5	1	8	85	AMERICANS—
236	—	9	—	15	—	—	5	9	30	318	Punjab—200-F (and New Types)
61	—	—	—	—	—	—	—	—	—	61	Punjab (Unspecified—4-F)
89	—	1	1	—	—	—	—	1	4	93	Sind—4-F (200-F and F—1)
6	—	—	—	—	—	—	—	—	—	6	Sind (Unspecified—4-F)
13	—	—	—	—	—	—	—	—	—	13	Dharwar (Gadag 1)
120	—	1	—	—	—	—	9	—	9	128	Dharwar (Upland—Unspecified)
77	—	1	—	—	—	—	1	—	8	78	Cambodia (Cochin China A. 2)
—	—	—	—	—	—	—	—	—	—	—	Cambodia (Unspecified)
713	—	9	2	20	—	2	11	8	49	781	Total
108	—	—	5	1	1	—	1	2	10	124	BROACH—
132	—	—	4	—	2	—	1	—	6	140	Seri Mavari (Bert.)
—	—	—	—	—	—	—	—	—	—	—	Broach (Unspecified)
240	—	—	9	1	3	—	2	5	54	264	Total
15	—	—	1	—	—	—	—	—	7	22	ORISSAS—
1	—	—	—	—	—	—	—	—	1	2	Malabar
163	—	—	9	—	—	—	15	—	24	184	Catch
27	—	—	—	—	1	—	—	—	1	28	Wagad
—	—	—	—	—	—	—	—	—	—	—	Docheras (Unspecified)
182	—	10	—	1	23	1	—	—	37	190	Total
48	—	—	—	—	—	—	5	—	22	48	SOUTHERNS—
87	—	17	—	—	—	—	—	—	22	79	Karnataka (J. yewari)
28	9	15	—	—	—	—	1	2	26	79	Karnataka (Unspecified)
14	—	8	1	—	—	—	—	—	14	28	Western (Lower and Mesagari)
17	4	8	—	—	—	—	2	5	4	18	Northern
80	—	—	—	—	—	—	9	—	5	60	Cochin (and Warragel)
89	—	—	—	—	—	—	—	—	5	72	Karnataka
5	—	—	—	—	—	—	—	—	—	5	Tinnevely
—	—	—	—	—	—	—	—	—	—	—	Salerno
832	7	40	5	—	—	—	11	5	63	417	Total
—	—	—	—	—	—	—	—	—	—	—	COCHIN—
11	—	—	—	—	—	—	—	—	—	11	BURMAS (Wagad and Wagad)
6	—	5	—	—	—	—	—	—	5	11	OTHER SORTS
2,130	31	54	31	90	100	84	84	19	413	2,543	Total Indian Cotton
54	—	—	—	—	—	—	—	1	1	55	AMERICANS
62	—	5	5	—	—	—	—	—	10	72	KOTIPPAKS
515	—	15	1	1	—	—	—	—	51	524	EAST AFRICANS
22	—	—	—	—	—	—	—	—	—	22	OTHERS (Kodan, Mesopotamia, etc.)
221	—	5	21	1	1	5	—	1	32	253	Total Foreign Cotton
2,440	31	59	52	91	101	89	84	19	443	2,883	GRAND TOTAL
2,328	32	61	53	72	115	97	83	20	449	2,877	Indian raw cotton consumed in mills in India. (Figures compiled mainly from returns under the India Cotton Com. Act—Bale of 400 lbs. net)

gross weight 440 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

APPENDIX XV

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936

INDIAN CENTRAL COTTON COMMITTEE OFFICE

1. Secretary Mr P H Rama Reddi, M A., B Sc, I.A.S On deputation from Madras Department of Agriculture

2. Publicity Officer . Mr R D Mhira, M A, Agri (Oxon), Post-Grad, Dip Agri (Oxon.), Post-Grad, Res B Litt (Oxon) —

TECHNOLOGICAL LABORATORY, BOMBAY

3. Director .	Dr Nazir Ahmad, M Sc, Ph.D (Cantab), F Inst P	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay
4 Spinning Master ..	Mr R P Richardson, F T I	Demonstrator (Cotton Spinning), Technical College, Oldham
5 Senior Research Assistant (Chemist)	Mr D L Sen M Sc, Tech (Manch), M Sc (Bom), A II Sc, A I C	Research Student at the Indian Institute of Science and Manchester College of Technology
6 Senior Research Assistant (Physicist)	Mr. N Hari Rao, M Sc (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics)
7 Senior Research Assistant (Physicist)	Mr Ram Saran Koshal, M Sc (Punjab)	Research Scholar, Technological Laboratory (Textile Physics)
8 Junior Research Assistant (Microscopist)	Mr Amar Nath Gulati, M Sc (Punjab)	Imperial Institute of Veterinary Research, Mukteswar, U.P.
9 Junior Research Assistant . . .	Mr C Nanjundayya, M Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics)

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE FUNDS AS ON AUGUST 31st 1934—contd.

TECHNICAL LABORATORY Bombay—contd.

10. Junior Research Assistant	Dr K. R. Sen, D.Sc. (Dorn)	Research Scholar Technical Staff and Technical Assistant	—
11. Statistician and Personal Assistant	Mr V. Venkatesan, M.A. (Madras)	Statistical Assistant, Laboratory Government of Bombay Bombay	—
12. Temporary Chemist	Dr Laxji Thorda, Dr (ag. Germany)		—
13. Electrician	Mr Heroldas Lobo, L.E.E. (V.J.T.I.)		—
14. Spinning Assistant	Mr V. Iyengar		—
15. Senior Tester	Mr H. R. Joshi, B.Sc.		—
16. Senior Tester	Mr S. S. Bakthavathur L.T.C. (V.J.T.I.)		—
17. Junior Tester	Mr K. O. Desai		—
18. Junior Tester	Mr R. O. Panvalkar B.Sc.		—
19. Junior Tester	Mr O. D. Khilji B.Sc.		—
20. Junior Tester	Mr K. V. V. N. N. N.		—
21. Junior Tester	Mr V. V. Moliak, B.Sc.		—
22. Junior Tester	Mr L. V. Sundaresan, B.A.		—
23. Junior Tester	Mr P. S. Sambamurthy		—
24. Junior Tester	Mr O. J. Khartar B.Sc.		—
25. Junior Tester	Mr Samsam Samson, B.Sc.		—
26. Junior Tester	Mr A. J. Parthi		—
27. Junior Tester	Mr U. K. Desai, B.A.		—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936—*contd*

TECHNOLOGICAL LABORATORY, BOMBAY—*concd*

28	Junior Tester	Mr P V Nachane, B Sc	—
29	Junior Tester	Mr C S Ramanathan, B Sc	—
30	Junior Tester	Mr S N Rao, M Sc	—
31	Junior Tester	Mr B N Prabhakar B Sc	—
32	Draughtsman	Mr B G Mehta	—
33	Statistical Clerk	Mr R Krishna Iyer	—
34	Statistical Clerk	Mr P K Wagle	—
35	Mechanic	Mr J B Kharas	—

214

INSTITUTE OF PLANT INDUSTRY, INDORE

36	Director	Mr T R Low, B Sc, (Agrn) (London), I A.S	Principal, Agricultural College, Cawnpore On deputation from the United Provinces Department of Agriculture
37	Geneticist and Botanist	Mr J B Hutchinson, M A (Cantab)	Assistant Geneticist and Botanist, Trinidad (1926-33)
38	Chemist and Agronomist	Mr Y D Wad, M A, M Sc (Bombay), A.I.I Sc	Research Student, Indian Central Cotton Committee
39	Farm Superintendent	Mr G C. Tambe, B Ag (Bombay)	—
40	Extension Officer	Mr Kuber Singh, B Ag (Bombay)	—
41	Senior Botanical Assistant	Mr R L M Ghose, M Sc (Allahabad)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMISSION'S FUNDS 18 ON AUGUST 21st 1936—contd.

INSTITUTE OF PLANT INDUSTRY, LYONS—contd.

		Research Student Cotton Committee	Indian	Central
42.	Assistant Farm Superintendent	Mr S. C. Talwar, B.Sc. (Bombay)	—	—
43.	Personal Assistant	Mr V. V. Srivastava, M.Sc. (Lucknow)	—	—
44.	Statistical Assistant	Mr V. O. Parar, B.Sc. (Bombay)	—	—
45.	Genetical Assistant	Mr Bhola Nath, M.Sc. (Panjab)	Research Student, Cotton Comm. Use	Indian Central
46.	Plant Breeding Assistant	Mr C. P. Dutt, M.Sc. (Calif.)	—	—
47.	Extra Assistant	Mr K. M. Srinivas, B.Sc. (Vijapur)	—	—
48.	Botanical Assistant	Mr P. D. Gadhkar, M.Sc. (Vijapur)	—	—
49.	Second Plant Breeding Assistant	Mr M. L. A. Anand, M.Sc. (Lucknow)	King Edward Memorial Endowed Re- search Scholar at I.P.I.	12 15
50.	Chemical Assistant (Temporary)	Mr B. K. Venukumar, M.Sc. (Allahabad)	Research Student, Institute of Plant Industry, Indore	12 15
51.	Agronomical Assistant (Temporary)	Mr K. V. Ambekar, M.Sc. (Haryana)	Do	Do
52.	Junior Farm Assistant (Temporary)	Mr V. V. Bhargava, B.Sc. (Allahabad)	Do	Do
53.	Junior Farm Assistant (Temporary)	Mr S. S. Gangadhar Bhoila, B.Sc. (Bombay).	—	—
54.	Artist	Mr J. S. Onkar	—	—
		BOMBAY RESEARCH SOCIETY.		
		(1) Broad Cotton Breeding Scheme		
55.	Cotton Breeder	Mr P. L. Patel, M.Sc. (Iowa, U.S.A.)	—	—

CENTRAL COTTON COMMITTEE'S

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN FUNDS AS ON AUGUST 31st, 1936—*contd*

BOMBAY RESEARCH SCHEMES—*contd*

Breach Cotton Breeding Scheme—contd

Mr B J Thakar, B.Ag

On deputation from Bombay Department of Agriculture

56 Botanical Assistant

Mr Y S Kulkarni, B Ag (Bombay)

57 Pathological Assistant

(**) *Jalgaon Cotton Breeding Scheme.*

Mr V L Bhosekar, B Ag (Bombay)

On deputation from Bombay Department of Agriculture

58 Botanical Assistant

Mr J D Ranadive, B Ag (Bombay)

Research Student, Indian Central Cotton Committee

59 Pathological Assistant

216

BOMBAY SEED DISTRIBUTION SCHEMES

(*) *Surat Scheme*

Mr V D Desai

On deputation from Bombay Department of Agriculture

Mr V V Patel, B Ag (Bombay)

Do do

61 Cotton Assistant

(**) *Khandesh (Bambla) Scheme*

Mr S V Shevde, L Ag

On deputation from Bombay Department of Agriculture

62 Cotton Superintendent, Amalner

Do

Mr R B Nimbalkar, B Ag (Bombay)

do

63 Agricultural Overseer

Mr D M Kulkarni, B.Ag (Bombay)

do

64 Superintendent, Bhadgaon Farm

(***) *B D S Scheme*

Mr D A Dave, B Ag

65 Agricultural Overseer

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st 1926—contd.

BOMBAY SEED DISTRIBUTION SCHEMES—contd.

(a) *Jayrami Scheme.*

66. Agricultural Overseer	Mr R. S. Todor B.Ag (Bombay)	—
67. Agricultural Overseer	Mr D. M. Dhuruma, B.Ag. (Bombay)	—
68. Agricultural Overseer	Mr D. V. Hiremath, B.Ag. (Bombay)	—
69. Agricultural Overseer	Mr S. M. Teppathiti, B.Ag. (Bombay)	—
70. Agricultural Overseer	Mr V. H. Helgall, B.Ag. (Bombay)	—
	(a) <i>Gadag No. 1 Scheme.</i>	
71. Agricultural Overseer	Mr R. S. Patil, B.Ag. (Bombay)	—

BOMBAY COTTON FORECAST IMPROVEMENT SCHEME.

Mr G. R. Ambekar School Final

On deputation from Bombay Department of Agriculture.

SEED PATHOLOGICAL RESEARCH SCHEME.

72. Provincial Officer	Mr R. M. Dabral, M.Sc. (Benares)	—
73. Cotton Physiologist, Sakrand	Dr A. M. Shalkh, M.Sc. (Bombay) Ph.D. (London) D I.C., A.I.C.	—
74. Senior Assistant	Mr Rustom M. Ranji, Dip. Ag. (Bombay)	—
75. Junior Assistant	Mr H. W. Jughal, Dip. Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
76. Junior Assistant	Mr T. J. Mallani, M.Sc. (with distinction) (Bombay).	—
77. Junior Assistant		—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936—*contd*

SIND SEED DISTRIBUTION SCHEME.

78	Statistical Assistant	Mr S S Chunev, B Sc (Agra)	—	
79	Cotton Supervisor, Indus Left Bank, Murpurkhas	Mr H A Idnani, B Ag (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture
80	Cotton Supervisor, Indus Right Bank, Dadu	Mr W P Shahani, B Ag (Bombay)	..	On deputation from Sind Department of Agriculture
81	Senior Assistant to Indus Right Bank	Cotton Supervisor, Mr Agha Khan Mahomed, 2 years' Lyallpur Course	Do	do
82	Senior Assistant to Indus Left Bank.	Cotton Supervisor, Mr A R Aram, B.Ag (Bombay), C H D (Manchester)	Do	do
83	Junior Assistant to Indus Right Bank	Cotton Supervisor, Mr Lekhra	Do	do
84	Junior Assistant to Indus Right Bank.	Cotton Supervisor, Mr W R Shahani	—	
85	Junior Assistant to Indus Right Bank	Cotton Supervisor, Mr Gulshah Umarshah		On deputation from Sind Department of Agriculture
86	Junior Assistant to Indus Right Bank	Cotton Supervisor, Mr Prensing T Advani	—	
87	Junior Assistant to Indus Left Bank.	Cotton Supervisor, Mr S A Sidiki, Dip Agri (Bombay)	—	
88	Junior Assistant to Indus Left Bank	Cotton Supervisor, Mr K S Tharumal		On deputation from Sind Department of Agriculture
89	Junior Assistant to Indus Left Bank	Cotton Supervisor, Mr T T Naramdas	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE
FUNDS AS ON AUGUST 31st 1916-17

AND SEED DISTRIBUTION SCHEMES—contd.

90.	Junior Assistant to Cotton Supervisor Indus Left Bank.	Mr Jote D Atradi, B.A. (Bombay)	On deputation from P. & M. Department of Agriculture.
91.	Junior Assistant to Cotton Supervisor Indus Left Bank.	Mr Lachmanadas	—
92.	Junior Assistant to Cotton Supervisor Indus Left Bank.	Mr L. O. Piracha, B.A. (Bombay)	On deputation from P. & M. Department of Agriculture.
93.	Junior Assistant to Cotton Supervisor Indus Left Bank.	Mr H. V. Bolina, B.A. (Bombay)	—

CENTRAL PROVINCES RESEARCH SCHEMES

(i) Distributed Scheme

94.	Economic Botanist for Cotton	Mr D. N. Mahila, B.A. (Oren.) & L.S.	On deputation from Central Provinces Department of Agriculture.
95.	Assistant to Economic Botanist for Cotton.	Mr S. C. Roy, L.A., and Post-Graduate Punjab.	Do. do.
96.	Assistant to Economic Botanist for Cotton.	Mr H. B. Parle, M.Sc. (Punjab)	Research Student, Indian Central Cotton Commission.
97.	Assistant to Economic Botanist for Cotton.	Mr D. G. Sawaragochkar, L.A. (Ilona)	On deputation from Central Provinces Department of Agriculture.
98.	Assistant to Economic Botanist for Cotton.	Mr D. L. Jaisuria, L.A. (Ilona)	Do. do.
99.	Assistant to Economic Botanist for Cotton.	Mr D. Y. Bhambhani, L.A. (Ilona)	Do. do.
100.	Assistant to Economic Botanist for Cotton.	Mr V. N. Paranjpe, B.Sc.	—

LIST OF CASHIERS AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEES
FUNDS AS ON AUGUST 1930—*contd*

CENTRAL PROVINCES REFRANCH SCHEME—*contd*

(ii) *Entomological Scheme*

101	Agricultural Assistant	Mr M S Patel, B Ag	—
COMMISSIONED I AND STAFF COTTON AND MARKETING OF UPLAND COTTON SCHEMES I, C P AND BIKAN			
102	Agricultural Assistant	Mr J P Tiwari, B Ag	—
103	Agricultural Assistant	Mr L P Khare, B Ag	—
104	Agricultural Assistant	Mr G N Wardhakar, B Ag	—
105	Agricultural Assistant	Mr L B Deshpande, B Ag	—
106	Agricultural Assistant	Mr N B Chincholkar, B Ag	—
107	Agricultural Assistant	Mr J N Kulkarni, B Ag	—
108	Agricultural Assistant	Mr G C Tiwari, Certificate Course of Agricultural College, Nagpur	—
109	Agricultural Assistant	Mr W R Patwardhan, B Ag	—
110	Agricultural Assistant	Mr M D Anandoo, B Ag	—
111	Agricultural Assistant	Mr Rafat Ali Haqqani, B Ag	—
112	Agricultural Assistant	Mr K Shooramanghi Chowhan, B Ag	—
113	Agricultural Assistant	.. Mr R S Shrivalkar, B Ag	—
114	Agricultural Assistant	Mr V S Hingankar, B Ag	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st 1936—contd

18

MADRAS RESEARCH SCHEMES

(i) *Herbaceous Schemes*

115. Gasified Assistant	Mr R. Balasubramania Ayyar B.A., B.Sc. On deputation from Madras Department of Agriculture (Ag).	—	13
116. Junior Assistant	Mr G. Sothadri Ayyangar M.A.	—	14
117. Junior Assistant	Mr V. Ramaswami Mudaliar B.A.	—	15
118. Sub-Assistant	Mr D. Devadairatham B.S.L.C. (Botany) (Intermediate) On deputation from Madras Department of Agriculture	—	16

(ii) *Perennials and Physiological Schemes.*

119. Bio-Chemist	Dr. S. Kasinatha Ayyar B.A., Ph.D. (London.) On deputation from Madras Department of Agriculture	Do	17
120. Physiological Botanist	Mr T. R. Narayana Ayyar B.A. (Cantab.) B.Sc. (Ag.).	do.	18
121. Parasitologist	Mr P. N. Krishna Ayyar B.A.	Do.	19
122. Assistant Botanist	Mr K. Dharmarajulu, M.Sc. (Bombay)	Research Student, Indian Central Cotton Committee.	20
123. Assistant Entomologist	Mr V. Margabandu M.A.	On deputation from Madras Department of Agriculture.	21
124. Assistant Botanist	Mr N. O. Narayanan, B.Sc. (Ag.)	—	22
125. Assistant Entomologist	Mr P. S. Narayanaswami B.Sc. (Ag.)	On deputation from Madras Department of Agriculture.	23
126. Assistant Chemist	Mr K. Sesharishi, B.Sc. (Ag.)	—	24
127. Assistant Botanist	Mr S. Anantham, B.Sc. (Ag.)	—	25

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936—*contd*

MADRAS RESEARCH SCHEMES—*contd*

(iii) *Fodder Cholam Scheme*

Mr M R Balakrishnan, B A, B Sc (Agri) On deputation from Madras Department of Agriculture

128 Assistant

Mr S Sundaram, B A, B Sc (Agri) Do do

129 Assistant

(iv) *Breeding of Nadam Cotton*

Mr R Krishnamurthi, B Sc (Ag) Do do

130 Assistant

MADRAS SEED DISTRIBUTION SCHEMES

(i) *Pay and Allowance of Business Manager.*

131 Business Manager, Tiruppur Co-operative Trading Society, Ltd Co. Mr K Avudanayakam Pillai, S S L C. On deputation from Madras Department of Agriculture 222

(vi) *Co 2 Scheme*

Mr Damodara Prabhu, B Sc (Agri) Do do

132 Agricultural Demonstrator

Mr L Krishnan, B A, B Sc (Agri) Do do.

133 Agricultural Demonstrator

Mr P P Syed Mohamed, B Sc (Agri) Do do

134 Agricultural Demonstrator

Mr P N Muthuswami, B Sc (Agri) Do do

135 Agricultural Demonstrator

Mr K Narayana Nayar, B Sc (Agri) Do do

136 Agricultural Demonstrator

PUNJAB RESEARCH SCHEMES

(i) *Botanical Scheme*

137 Cotton Research Botanist Mr Mohd Afzal, B Sc (Agri) (Punjab), Research Student, Indian Central Cotton Committee, and State Research Scholar On deputation from Punjab Department of Agriculture

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st 1936—contd.

PEWIS RESEARCH SCHOLARS—contd.

(i) Botanical Scheme—contd.

			On deputation from Punjab Department of Agriculture
138. Assistant to Cotton Research Botanist	Chaudhri Mohammad Akbar L.Ag		
139. Agricultural Assistant	Sh. Sarup Singh, L.Ag., M.Sc. (Torres) U.S.A.	Do.	do.
140. Agricultural Assistant	Th. Ranbir Singh, D.Sc. (Agri.)	Do.	do.
141. Agricultural Assistant	S. Kehr Singh, B.Sc. (Agri.)	Do.	do.
142. Agricultural Assistant	Sh. Anwar Singh, B.Sc. (Agri.)	—	—
143. Agricultural Assistant	Sh. Santokh Singh, B.Sc. (Agri.)	On deputation from Punjab Department of Agriculture.	
144. Agricultural Assistant	S. Fatch Ali Shah B.Sc. (Agri.)	Do.	do.
145. Agricultural Assistant	Ch. Karahi Ram, B.Sc. (Agri.) Gold Medalist.	—	—
146. Agricultural Assistant (B Class)	Mr B. K. Daulat, L. O. (Course)	On deputation from Punjab Department of Agriculture.	
147. Technical Assistant	Ch. Mohammed Rashid Khan, L.C. Course Munshi Fazil, F.A. (Punjab University)	Do.	do.
148. Statistical Assistant	Mr Bhagat Ram Sehgal, M.A. (Punjab)	—	—
149. Assistant Cotton Entomologist	(ii) Entomological (Fruit and Spotted Boll-worm) Scheme. Mr M. Haroon Khan, B.Sc. (Hons.) (London) A.R.C.S. (London).	—	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936—*contd*

PUNJAB RESEARCH SCHEMES—*contd*

(ii) *Entomological (Pink and Spotted Boll-worm) Scheme*—*contd*

150	Field Assistant Research Work	Mr Latha Ram, B Sc	—	
151	Field Assistant Research Work	L Ganda Ram, B Sc, F E L	—	
152	Field Assistant Research Work	Mr Piare Mohan, B Sc (Hons), M Sc	—	
153	Field Assistant Research Work	Mr Manzoor Abbas, B Sc (Agri)	—	
154	Field Assistant Research Work	Mr Ghulam Ullah, B Sc (Agri)	—	
155	Research Assistant	Mr Abdul Ghanu, B Sc (Agri)	—	
156	Research Assistant	Mr Dharm Bir Kohli, B Sc (Agri)	—	
(iii) <i>White Fly Scheme</i>				
157	Assistant Cotton Entomologist	L Kedar Nath Trehan, M Sc (Punjab)	Research Student, Cotton Committee	Indian Central
158	Field Assistant	Mr Hari Chand, B Sc (Agri)	—	
(iv) <i>Root Rot Scheme</i>				
159	Assistant Cotton Mycologist	Dr R S Vasudeva, B Sc, Ph.D (London), D I C (London)	—	
160	Agricultural Assistant	Mr Mohd Ashraf, B Sc (Agri)	—	
161	Agricultural Assistant	Ch Mohd Rafiq, M Sc (Hons)	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st 1936—contd.

PUNJAB RESEARCH SCHEMES—contd.

(a) *Physiological (Previous Period Failure) Scheme*

162. Plant Physiologist	Prof R. H. Daxton M.Sc., Ph.D.	On deputation from Bombay Educational Department.
163. Assistant Physiologist and Microscopist	Dr. S. A. Verma, M.Sc. (Bombay), Ph.D. (London), D.I.C.	—
164. Bio-Chemist	Dr. K. M. Samant, M.Sc., Ph.D.	—
165. Chemical Assistant	Mr. L. L. Shah B.Sc. (Agrl.)	—
166. Physiological Assistant	Mr. Sacha Singh, B.Sc. (Agrl.)	—
167. Statistical Assistant	Mr. Kanwar Kishan, M.A. (Punjab)	—
168. Field Assistant	Mr. Mukhtar Singh, B.Sc. (Agrl.)	—

125

UNITED PROVINCES, BOMBAY AND MUMBAI SURVEY SCHEME.

169. Agricultural Inspector	Mr. Altar Singh, B.Agr. (Calcutta)	On deputation from the United Provinces Department of Agriculture.
-----------------------------	------------------------------------	--

HYDRABAD RESEARCH SCHEMES.

(i) *Botanical Scheme*

170. Cotton Research Botanist	Mr. Sahib Kallias Sahib M.Sc. (Punjab)	Late Cotton Inspector in the Department of Agriculture Iraq Baghdad.
171. Assistant Cotton Research Botanist	Mr. D. V. Narayanaiah, Dip. Agrl. (Poona)	On deputation from Bombay Department of Agriculture.
172. Assistant Cotton Research Botanist	Mr. V. K. Reddy B.A. (Madras), B.Agr. (Bombay)	On deputation from H. E. H. the Vizianagaram Department of Agriculture.
173. Inspector Variety Testing Stations	Mr. V. R. Yardi, B.Agr. (Bombay)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1936—*contd*

HYDERABAD RESEARCH SCHEMES—*contd*

(11) *Hyderabad (Pink and Spotted Boll-worm) Scheme*

174. Cotton Entomologist	Mr H D Nangpal, M Sc (Punjab)	..	Research Student, Indian Central Cotton Committee and Assistant Entomologist, United Provinces Pink Boll-worm Scheme
--------------------------	-------------------------------	----	--

175 Senior Research Assistant	Mr N T Nadkarny, B Ag (Bombay), Post-Graduate Course in Entomology at Poona Agricultural College	—
-------------------------------	--	---

176 Junior Research Assistant	Mr T E Krishnaswamy, B Sc (Agri) (Coimbatore)	—
-------------------------------	---	---

HYDERABAD SEED DISTRIBUTION SCHEME

177 Inspector	Mr M V Chitnis	—
---------------	----------------	---

BARODA RESEARCH SCHEMES.

(12) *Root Rot Scheme*

178 Cotton Breeder	Mr M S Pandya, B Ag (Bombay), B So	On deputation from Bombay Department of Agriculture
179 Breeding Assistant	Mr A F Patel, B Ag (Bombay)	—
180 Mycological Assistant	Mr G H Desai, B Ag (Bombay)	—
181 Field Assistant	Mr V G Kulkarni	—
182 Field Assistant	Mr M C Patel	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st 1936—*contd.*

RAMODA RESEARCH SCHEMES—*contd.*

(ii) *Plant Path & Propaganda Schemes*

Mr H. M. Desai, B.A.

Mr R. S. Patel

BHEKAR GANGE CANAL SCHEME

Mr Arjan Singh, B.Sc.

DESOOL COMILLA COTTON SCHEME

Mr H. K. Mahender M.Sc.

MISRE (DODDANATH) SCHEME

Mr K. Gopala Iyengar M.Sc. (Bombay)

Mr O. Srinivas Iyengar M.Sc. (Mysore)

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

Mr R. L. N. Iyengar B.Sc.

Mr H. R. Nayak, Inter Science (Madras)

Mr S. Raja Raman, B.A. (Madras), M.Sc. (Dornare)

Mr Srinagabhusham, B.Sc. (Mysore)

Mr K. S. Naray D.A., I.L.L.

182. Plant Power Officer

184. Plant Puller Propagandist

185. Cotton Assistant

186. Cotton Research Officer

187. Junior Assistant Botanist,

188. Field Assistant

189. Under Cotton Specialist, Coimbatore

190. Under Cotton Breeder Dharwar

191. Under Cotton Research Botanist Lyall
pur

192. Under Deputy Director of Agriculture,
Gujarat, Surat.

193. Under Botanist, Agricultural Research
Station, Sakrand.

Research Student, Indian Central
Cotton Committee

Formerly Junior Tester at Techno-
logical Laboratory Bombay

Research Student, Indian Central
Cotton Committee.

Formerly Junior Tester at Techno-
logical Laboratory Bombay

APPENDIX XVI RESEARCH STUDENTSHIPS

Year of appointment	Name	Where posted on appointment	Branch of Cotton Research in which scholarship granted	How now employed	REMARKS
1923	Sohan Singh Bindra, M Sc, Honours School (Punjab)	Lyalpur	Cotton Entomology	Punjab Agricultural Department Cotton Research Botanist, Punjab Botanical Research Scheme	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab Recently in Agricultural Department, Kenya
"	Mohammed Afzal, B Sc (Punjab)	Do	Cotton Botany (Plant Breeding)	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme	Indian Central Cotton Committee
"	Sheo Shankar Pande, M Sc (Punjab)	Nagpur	Do	Reader in Botany, Khalsa College, Amritsar	Do
"	Jiwan Singh, M.Sc (Punjab)	Do	Cotton Mycology	University Lecturer in Botany, Calcutta University, from 31st January 1929	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme
"	Ilabanto Banerji, M Sc (Calcutta)	Combatore	Cotton Botany		Held a Senior Research Studentship under Dr M A Sampathkumaran, M A, Ph D, Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928

RESEARCH STUDENTSHIPS—contd

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS
1923	B. B. Desai, B.Ag. (Bombay)	Dharwar	Cotton Botany	Sind Agricultural Department, Cotton Breeder Sind Mirpurkhas.	Held a Senior Research Studentship at the Institute of Plant Industry Indore from July 1926 to June 1927
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	M.Sc. Coimbatore	Do.	Lecturer in Botany Cotton College, Ganesh, Assam.	
	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory Matunga, Bombay	Textile Physics	Senior Research Assistant (Physicist), Technological Research Laboratory Matunga, Bombay	Indian Central Cotton Committee.
	H. D. Nangpal, M.Sc. (Bombay)	Bombay	Cotton Entomology	Entomologist, Hyderabad Pink and Spotted Bollworm Scheme, Parbhani	Late Special Research Assistant, Pink Bollworm Investigation, United Provinces. Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Bollworm Investigation Scheme, Indian Central Cotton Committee
1925	Vishwa Ram Singh, L.Ag. (Agricultural College Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	
	Akbar Ali, B.Sc. (Punjab)	Lyalpur	Cotton Botany (Plant Breeding.)	Punjab Agricultural Department Assistant, Punjab Botanical Research Scheme.	

RESEARCH STUDENTSHIPS—*contd*

Year of appointment	Name	Where posted on appointment	Branch of Cotton Research in which scholarship granted	How now employed	REMARKS
1925	Kidar Nath Trehan, M Sc (Punjab)	Lyallpur	Cotton Entomology	Punjab Agricultural Department, Assistant, Cotton Entomologist, White Fly Investigation Scheme, Punjab	Held Senior Research Studentship for study of "White Fly" problem at Khanawal Indian Central Cotton Committee Technological Assistant, Dharwar, up to 31st July 1929 Went abroad for further study Indian Central Cotton Committee
"	S. E. Kumana, B A, M Sc (Bombay)	Technological Research Laboratory, Matunga, Bombay	Cotton Technology		
"	J D Ranadive, B Ag (Bombay)	Dharwar	Cotton Mycology	Pathological Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh	Resigned in July 1925
"	P K. Roy, M Sc (Dacca)	Technological Research Laboratory, Matunga, Bombay	Textile Physics		
"	K R Sen, M Sc (Dacca)	Do	Do	Technological Assistant, Lyallpur	Indian Central Cotton Committee Obtained a Doctorate (D Sc) in 1934 Resigned in August 1926
"	L N Rao, M Sc (Calcutta)	Do	Cotton Microscopy	Lecturer in Botany, Central College, Bangalore	
1926	D F Kapadia, B.A (Bombay), M Sc (Tech), (Manchester)	Do	Cotton Technology	Head of the Textile Manufactures Department, Victoria Jubilee Technical Institute, Bombay	Late Senior Research Assistant, Assistant Technologist, Technological Laboratory, Matunga, Bombay

RESEARCH STUDENTSHIPS—contd

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	REMARKS.
1926	Ram Saran Koshal, M.Sc. (Punjab)	Technological Research Laboratory Matunga, Bombay.	Textile Physics	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay	Indian Central Cotton Committee
"	M. A. Sharma Iyengar B.A. (Bombay)	Sarat	Cotton Physiology	Sind Agricultural Department Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	Awarded a Training Grant for foreign study in 1911.
"	Karam Singh Lamba, B.Sc. (Punjab), Y. D. Wad, M.A., M.Sc. (Bombay), A.L.I.Sc.	Lyalpur Coimbatore	Cotton Entomology Cotton Bio-chemistry	Chemist and Agronomist, Institute of Plant Industry Indore.	Re-designated in July 1927
"	H. A. Idnani B.A. (Bombay)	Institute of Plant Industry Indore.	Cotton Botany	Kind Agricultural Department, Cotton Superintendent, Indus Right Bank, Sind Seed Distribution Scheme Dadin.	Indian Central Cotton Committee.
"	S. O. Talewara, B.A. (Bombay)	Do.	Do.	Assistant Farm Superintendent, Institute of Plant Industry Indore.	Do.
1927	R. Lakshminarasimha Iyer, B.Sc. (Mysore).	Technological Research Laboratory Matunga, Bombay	Cotton Technology	Technological Assistant, Coimbatore.	Do.
"	Anant Krishna Thakur M.Sc. (Bombay).	Institute of Plant Industry Indore.	Cotton Bio-chemistry	Assistant Chemist, Indian Lin Research Association.	Do.
"	Dor Raj Mishra B.Sc. (Punjab).	Lyalpur	Cotton Entomology.		Secured Government Scholarship for study abroad and obtained Ph. D. (Canada).

RESEARCH STUDENTSHIPS—contd.

232

Year of appointment	Name	Where posted on appointment	Branch of Cotton Research in which scholarship granted	How now employed	REMARKS
1927	Uma Shankar, M Sc (Allahabad)	Cawnpore	Cotton Entomology	Assist Professor of Zoology and Entomology, Agricultural College, Cawnpore	Obtained Doctorate at Edinburgh
"	Shripad Shamrao Rane, M Sc (Benares Hindu University)	Institute of Plant Industry, Indore	Cotton Physiology	Unemployed	Awarded a Foreign Scholarship by the Indian Central Cotton Committee (Lond)
"	Sant Singh Verma, M Sc (Benares Hindu University)	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation		
"	Lakshmi Narayan Mathur, M Sc (Punjab)	Institute of Plant Industry, Indore	Cotton Breeding	Crop Botanist, Ujjain, Gwalior Department of Agriculture	
"	Kadaba Rangaswamy, M Sc (Calcutta)	Coimbatore	Do	Unemployed	
"	S Shamser Singh, M Sc (Punjab)	Institute of Plant Industry, Indore	Cotton Agronomy	Agricultural Officer, Bikaner State	
1928	K Dharmarajulu, M Sc (Bombay)	Dharwar	Cotton Mycology	Assistant Botanist, Madras	Indian Central Cotton Committee
"	Piara Mohan, B Sc, Honours School (Punjab), M Sc	Cawnpore	Cotton Entomology	Pempheres and Physiological Scheme	Do
"	R N Gidwani, B Ag (Bombay)	Surat	Cotton Agronomy	Field Assistant, Parasite Work, Pink and Spotted Boll-worm Scheme, Punjab	
"	M Kanta Raj, M.A, F.A. (Agr.) (University of Poona)	Institute of Plant Industry, Indore	Do	Sind Agricultural Department, Inspector of Agriculture, Eastern Narasur, Mirpurkhas	
"	C Nanjundayya, (Calcutta)	Research Laboratory, Matunga, Bombay	Cotton Technology	Madras Agricultural Service	
				Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay	Indian Central Cotton Committee

RESEARCH STUDENTSHIPS—contd.

233

Year of appointment	Name	Where posted on appointment	Branch of Cotton Research in which scholarship granted	How now employed	Remarks
1929	Strangabudhana, B.Sc.	Technological Research Laboratory, Matunga, Bombay	Cotton Technology	Technological Assistant, Surat	Indian Central Committee
3	Bhal Prateep Singh Bhollari, B.Sc. (Agr.) (Punjab), Bhal Ajai Singh Gulzar, B.Sc. (Agr.) (Punjab), Madan Lal Bhatia, M.Sc. (Punjab)	Lyalpur Do. Do.	Cotton Marketing and Economics Do. Entomology	Punjab Agricultural Department Do. Abroad for further study	Indian Central Committee
1930	Bhola Nath, M.Sc. (Punjab)	Institute of Plant Industry, Indore	Cyology and Plant Breeding	Genetical Assistant, Institute of Plant Industry, Indore	Indian Central Committee
"	Pras Nath Mehra, M.Sc. (Punjab), Dra. Indira Nath Bhargava, M.A. (Lucknow), B. S. Sheshgiri, B.A. (Bombay), K. R. Dube, B.A. (Nagpur)	Sabrand Lucknow Sarat, Gujarat Nagpur	Do. Cotton Marketing and Economics Do. Do.	Do. Do. Do. Dist. Supervisor, Enquiry into the cost of production of Cotton and Sugar-cane crops, Central Provinces.	Designed Designed
"	Santosh Singh Jagt, B.Sc. (Agr.) (Punjab)	Lyalpur	Do.	Agricultural Assistant, Punjab Botanical Research Scheme, Madras Agricultural Service.	Indian Central Committee
1935	Doraiswami Ayyar, B.A. (Madras), Erithras Bohad Lal, M.Sc. (Cal.), Ph. D. (Edinburgh), M. U. Farmer, M.Sc. (Bombay)	Madras Lyalpur Technological Research Laboratory, Matunga, Bombay	Do. Cotton Entomology Cotton Technology	Do. Do. Do.	Under training Under training
2	G Rama Rao, B.Sc. (Bombay)	Do.	Do.	Do.	Do.

RESEARCH STUDENTSHIPS—concl'd

Year of appointment	Name	Where posted on appointment	Branch of Cotton Research in which scholarship granted	How now employed.	REMARKS
1931	Sant Singh Verma, M Sc (Benares Hindu University)	Imperial College of Science and Technology, London.	Plant Physiology		Completed training, July 1935 Obtained Ph D of London University
1933	S N Venkataramanan, B A, B Sc (Agri) (Madras)	Calcutta	Cotton Statistics	Madras Agricultural Service	...
"	C Jagannatha Rao, B.A (Madras)		Cotton Physiology	Research Student	Under training
1936	P Abraham, B A (Madras)		Cotton Cytology	Not yet joined	..
1933	M Taskhur Ahmad, B Sc (Agri) (Punjab)	Foreign Training Grants Trinity College, Cambridge	Entomology	Assistant Entomologist, Imperial Institute of Agricultural Research, Pusa	Completed training July 1936 Obtained M Sc of California University
"	G B Patel, B Ag (Bombay)	University of California, U S A	Cotton Breeding	Research Student	
1934	M A Shama Iyengar, B Ag (Bombay)	Tour in Hungary, England and Egypt	Study of Kalar (alkah) lands and cultivation of superior Egyptian cottons with special reference to soil and environmental conditions	Sind Agricultural Department Senior Assistant to Agricultural Chemist and Soil Physicist	
"	Nazir Ahmad, M Sc (Punjab)	Imperial College of Science and Technology, London	Entomology	Research Student	Under training
1936	Kidar Nath Trehan, M Sc (Punjab)	..	Applied Entomology	Not yet joined	..

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants

